MYSTIC RANGE PROJECT

FINAL

ENVIRONMENTAL IMPACT STATEMENT

USDA Forest Service
Black Hills National Forest
Mystic Ranger District
Rapid City, South Dakota

Commonly Used Acronyms and Abbreviations

AMP	Allotment Management Plan
AOI	Annual Operating Instructions
AU	Animal Unit
AUM	Animal Unit Month
BA	Basal Area
BHNF	Black Hills National Forest
BMP	Best Management Practices
C/C	Cow/Calf
CDA	Connected Disturbed Area
CEQ	Council on Environmental Quality
C/F	Cover Frequency
CFR	Code of Federal Regulations
DBH	Diameter Breast Height
DFC	Desire Future Condition(s)
DMA	Designated Monitoring Area(s)
DPC	Desired Plant Community
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FSR	Forest System Road
FEIS	Final Environmental Impact Statement
FP	Forest Plan
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
HM	Head Month
ID Team	Interdisciplinary Team
MA	Management Area
MIMS	Multiple Indicator Monitoring Study
MIS	Management Indicator Species
MMBF	Million Board Feet
MPB	Mountain Pine Beetle
MRP	Mystic Range Project
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
PFC	Proper Functioning Condition
ROD	Record of Decision
ROW	Right of Way
S&G	Standard(s) and Guideline(s)
SHPO	State Historic Preservation Office
SOLC	Species of Local Concern
T&E	Threatened and Endangered
USDA	United States Department of Agriculture

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Mystic Range Project
Final Environmental Impact Statement
Pennington and Custer Counties, SD

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Abstract: The Mystic Ranger District of the Black Hills National Forest has prepared a Final Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The Mystic Ranger District proposes to reissue grazing permits on all eight allotments, utilize adaptive management, and implement multiple resource management actions within the Mystic Range Project as guided by the Black Hills National Forest Land and Resource Management Plan (Forest Plan) as amended. The alternatives are No Action Alternative A, Alternative B, and Alternative C (Proposed Action). Implementation of Alternative A would eliminate grazing from all eight allotments two years after the decision is made. Implementation of Alternative B would reauthorize grazing on all eight allotments with no new construction of range structures. Implementation of Alternative C would reauthorize grazing on all eight allotments, similar to Alternative B, but includes requirements for construction of new range structures. Both Alternatives B and C include adaptive management approaches that might be used if determined necessary to meet resource goals. The preferred alternative includes elements from Alternative C. This Final EIS discloses the direct, indirect, and cumulative environmental impacts resulting from the proposed action and alternatives.

SUMMARY

The Black Hills National Forest proposes to reauthorize grazing of domestic livestock on eight allotments: Bald Horse (27,828 acres), Deerfield (7,874 acres), Palmer Gulch (14,190 acres), Porcupine (9,858 acres), Redfern (11,573 acres), Rimmer (2,011 acres), Slate Prairie (5,896 acres), and Tigerville (5,825 acres). The project area consists of approximately 85,055 acres of National Forest System lands. All of these subject allotments are due for environmental review, and if necessary, revision to current rangeland management practices.

The project's main focus is to determine whether or not livestock grazing should continue on the proposed allotments and, if so, what changes may need to be implemented to meet the Black Hills National Forest Land and Resource Management Plan, as amended (Forest Plan). The underlying needs for this proposal include:

- Improve livestock management so that it is consistent with the goals, objectives, standards, and guidelines of the Forest Plan, as amended
- Improve species composition of upland vegetation
- Improve streambank stability
- Improve riparian vegetation diversity and abundance
- Reduce the risk of livestock-vehicle collisions

Through varied public involvement and collaboration efforts, comments on the proposed action, potential concerns, and opportunities for managing the Mystic Range Project Area were solicited from Forest Service resource specialists, tribal representatives, members of the public, other public agencies, and organizations. Methods used to request comments included: Publishing the Notice of Intent (NOI) to prepare and EIS in the *Federal Register* on June 12, 2009; mailing a scoping letter that solicited comments to approximately 91 interested parties; conducted meetings with permittees of the eight allotments; and meeting with interested parties and individuals.

Comments received during the scoping process were used to help in defining issues, develop alternatives and mitigation measures, and analyze effects. Through review and analysis of the scoping comments and input, the Mystic Range Interdisciplinary Team (ID Team) identified three prevailing or key issues related to the proposed activities. The three key issues include: 1. Soil and Water/Stream/Riparian. 2. Upland Vegetation and 3. Social/Economics.

These issues led the ID Team to develop alternatives to the proposed action. The alternatives analyzed in detail in this EIS are described as follows:

ALTERNATIVE A (NO ACTION)

Alternative A is the no action alternative. Under this alternative, grazing would not be reauthorized and the current permit holders would be notified that their term grazing permits would be cancelled. All term grazing permits would be cancelled after two years, pursuant to Forest Service Handbook (FSH) 2209.13 part 16.24, and Code of Federal Regulation (CFR) 36 CFR 222.4(4)(1). The FSH and CFR regulations indicate that a two-year notification is required prior to cancelling a permit, except in emergency situations.

The no action alternative would close eight allotments, eliminating livestock grazing from 85,055 acres of National Forest System lands. Permits would not be issued for any of the eight affected allotments unless a subsequent NEPA analysis and decision to restock the allotments was made.

Maintenance of range developments on the allotments would no longer be the responsibility of the permittees. Developments built to facilitate livestock management, including allotment and pasture fences, livestock enclosures, stock water ponds and water developments would be abandoned. Permittees who participated in the development of range improvements would be reimbursed for their amortized share, consistent with direction in FSH 2209.13, Chapter 70. Developments built that would benefit wildlife or reduce wildlife effects to resources, such as water developments and big game enclosures would remain in place and would continue to be maintained by the Forest Service and/or cooperators. Maintenance of unassigned allotment boundary fences would be assigned to the adjacent permittee, if one is present.

The following structural improvements would be abandoned:

- Approximately 145 miles of fence.
- Approximately 219 water developments.
- Approximately nine miles of pipeline

Spring boxes and underground pipes associated with water developments would be abandoned; pipes would be disconnected. If left in place, pipes would be capped on one or both ends to prevent water from flowing through the pipes. Unused fences would be removed as funds permit or as opportunities become available to utilize human resource labor programs such as the Youth Conservation Corp or other similar programs. All salvage materials would be stored for re-use, disposed of in a landfill, or recycled.

ALTERNATIVES B AND C

COMMON TO BOTH ACTION ALTERNATIVES

Both Alternatives B and C are designed to improve resource conditions in rangeland health, vegetation, watershed conditions, designated Botanical Areas, and wildlife habitat relative to livestock grazing. Both respond, to varying degrees, to the purpose and need for this project and the issues presented in Chapter 1 of this EIS.

Both alternatives would reauthorize grazing on all eight allotments. Changes would be made to some of the allotments. Structural range improvements would continue to be maintained annually, and reconstructed as needed. The permittee would be responsible for maintenance and reconstruction. The Forest Service would assist in funding material costs for reconstruction, as funding allows. Both alternatives include maintenance and reconstruction if some existing improvements and removal of others that are no longer needed. Reconstruction should generally be completed within the next 3-5 years. Removal of improvements that are no longer needed should be accomplished within the next 5-10 years.

Individual Allotment Management Plans (AMP's) would be assembled from the EIS record of decision summarizing directions for goals and objectives, approximate season of livestock use, kind and class of livestock, and stocking guidelines (approximate AUMs), applicable Forest Plan

Standards and Guidelines, anticipated rotation of livestock, planned range structural improvements including probable adaptive improvements (if exercised), and monitoring requirements.

Both alternatives include adaptive management options that could be implemented if needed to meet desired resource conditions. Adaptive management options are presented in Table 2-1. The main difference between the two alternatives is that Alternative C includes new structural improvements and prescribed burning, while Alternative B does not (USDA, Forest Service, Quimby, 2006, 2007).

Residual levels (or remaining height of key plant species) would be prescribed for riparian areas in Annual Operating Instructions. Initially this would be 4" for key specie(s) (University of Idaho, 2004). Proper allowable use by percent weight is 50% for uplands. Livestock would be moved to the next pasture before thresholds for upland and riparian triggers are reached, based on adherence to Forest Plan Standard 2505. Permittees are responsible for monitoring these conditions.

Alternatives B and C also have a long-term effectiveness monitoring plan to assess upland and riparian conditions and trends (see Chapter 2 Monitoring). The Forest Service is responsible for this effectiveness monitoring. If monitoring does not indicate progress towards desired conditions, it may be necessary to change proper allowable use percent utilization by weight from 50% to 45%, and/or increase residual riparian stubble height to six inches, and/or implement other adaptive management option(s).

The actual number of livestock and season of use would be determined each year prior to grazing and would be outlined in the Annual Operating Instructions (AOI). Factors such as drought, fire, or other specific management objectives could all influence annual livestock numbers and season of use. These variables are considered during winter meetings with each permittee to determine the upcoming grazing season's permitted use. The degree to which drought impairs the range's potential for future forage production depends on the intensity, frequency, and timing of grazing. Design criteria include development of a drought management strategy.

Both alternatives include adaptive management options that could be implemented if needed to meet desired resource conditions. Adaptive management options are presented in Table 2-1. The main difference between the two alternatives is that Alternative C includes new structural improvements and prescribed burning, while Alternative B does not (USDA, Forest Service, Quimby, 2006, 2007).

ALTERNATIVE B

COMMON TO ALL ALLOTMENTS

Alternative B is designed to maintain or improve resource conditions without construction of any new structural improvements such as fences, cattleguards, and water developments. Existing improvements would be maintained or reconstructed, as needed. Structural improvements that need to be maintained or reconstructed are presented by allotment in Appendix F.

Some tools for effecting change in condition and trend are adjusting the timing and duration of livestock use, and moving to the next pasture before allowable proper use by weight guidelines and/or riparian stubble height requirements are exceeded. The permittee's primary methods may be: 1) strategic salt and/or supplement placement, 2) range riding to influence animal behavior by working the livestock, and 3) culling animals that do not range out from riparian areas. The

purpose of using these methods is to achieve grazing efficiency, and reduce adverse effects on soils, riparian areas, and upland vegetation within the allotments that have specific areas that are not meeting desired conditions.

Bald Horse Allotment
The 27,828 acre Bald Horse Allotment is grazed using a nine pasture deferred rotation system from 06/01 to 10/26 each year, currently using 299 mature cattle (cow/calf pair) and approximately 1,921 AUMs. Existing structural improvements include 20 spring developments, three ponds, 14 water tanks, and approximately 37 miles of fence.

Alternative B would continue the existing nine pasture deferred rotation system on the Bald Horse Allotment. Alternative B would continue the split between north and so7uth for this allotment, and would formalize the split by dividing it into two separate allotments (north half would become Oblivion, south half would be Palmer Gulch). This alternative would continue the practice of non-use (no grazing) within the Buzzards Roost Pasture. Limited grazing could be allowed in the future if it is determined that such grazing would benefit other resource objectives. This alternative varies the order of pasture use each season. It reduces the number of days in the Middle Horse Pasture in order to improve riparian conditions. It would temporarily increase the number of days in the Prairie Creek Pasture to help offset this reduction. No use would be allowed before June 15 in the Prairie Creek Pasture to avoid conflicts with bighorn sheep lambing use.

Some existing improvements would be reconstructed to ensure their effectiveness and others that are no longer needed would be removed. This includes reconstructing the spring exclosure and repairing a pipeline to the water tank at Van Pelt Spring in the Lower Victoria Pasture, reconstructing or relocating the water development in the north half of the West Horse Pasture, improving drainage around the existing water tank (south of Twin Sisters) increasing exclosure protection in the South Bald Hills Pasture, and reconstructing and enlarging the spring exclosure on the northwest end of the Middle Bald Hills Pasture. To prevent cattle from straying into Pactola Basin, Alternative B removes an unused cattleguard from FSR 164 and uses the materials to install a cattleguard in FSR 165 to replace the existing steel gate; and repairs fencing along the Centennial Trail as needed in the Prairie Creek Pasture. Alternative B also would remove any interior fencing in the Buzzard's Roost Pasture, and remove a defunct water development on southwest corner of the Prairie Pasture.

Deerfield Allotment
The 7,874 acre Deerfield Allotment is grazed using a six pasture system from 06/06 to 10/25 each year, currently using 102 mature cattle (cow/calf pair) and approximately 628 AUMs. Existing structural improvements include 9 ponds and approximately 26 miles of fence.

Alternative B would continue the current six pasture grazing system, and maintain existing structural improvements. It recommends continued use of a range rider in the Heely Pasture. It would reconstruct the pond at the FSR 691.1J/691.1G junction for an improved watering source in the Gold Run Pasture. No improvements need removal at this time. As with the current practice, Alternative B would maintain the protective boundary and not allow grazing within the McIntosh Pasture. Some limited grazing could be conducted within the McIntosh Pasture if it is determined to be beneficial for weed control or other botanical purposes. This would require development of a separate management plan.

Palmer Gulch Allotment
The 14,190 acre Palmer Gulch Allotment has two permittees and is split into two separate grazing rotations: five pastures on the north half and six pastures on the south half. The north half is 4,843 acres in size and utilizes a five pasture deferred rotation system. The permitted use on the north half is from 06/01 to 10/10 currently using 74 cow/calf pair and approximately 424 AUMs. The south half is about 9,327 acres in size and utilizes a six pasture deferred rotation system. The permitted use is from 06/01 to 10/21 currently using 67 cow/calf pair and approximately 416 AUMs. It includes a small (20 acre) on/off winter use pasture (Summit) adjacent to private land. Existing structural improvements include three spring developments, 18 ponds, one water tank, and approximately 27 miles of fence for both halves of the allotment.

Alternative B would continue the split between north and south for this allotment, and would formalize the split by dividing it into two separate allotments. For this evaluation, reference will be made to the "North Half Palmer Gulch" and the "South Half Palmer Gulch".

North Half Palmer Gulch Allotment
Alternative B would operate on three pastures instead of five currently permitted because two of the pastures – Sawmill and Dump – are currently unusable. The Sawmill Pasture is currently not grazed due to lack of private land fencing. The Dump Pasture has not been grazed since 2003 because there are no railroad cattleguards in place to control cattle access onto the railroad right-of-way. In total, non-use in these two pastures would result in an equivalent of 44 days reduction in actual grazing use.

Alternative B includes reconstruction of the Joe Dollar Mine water tank and spring development in the Samalias Pasture. This alternative would also remove approximately one half mile of unneeded ROW fence in the Keystone Pasture and one third mile of unused fence on the Sawmill Pasture. Alternative B would also maintain two ponds in the north half of the Ford Pasture and three ponds in the south half of the Samalias Pasture.

South Half Palmer Gulch Allotment
All existing pastures would continue to be used on the South Half Palmer Gulch Allotment. The permitted use is from 06/01 to 10/21 currently using 67 cow/calf pair and approximately 416 AUMs, including the grazing of three cow/calf pair of occasional winter use on a 20 acre pasture from 10/22 to 5/31 for approximately 29 AUMs.

A cooperative effort may be made with the Hell Canyon Ranger District and the permittee in the design and implementation of an aspen regeneration project (Norbeck FEIS) to ensure livestock trailing to adjacent pastures is possible after project completion. No use would be allowed in the Palmer and Sunday Pastures before June 15 to avoid conflicts with bighorn sheep lambing use. Livestock would be removed from these pastures around August 1 to allow grass/forb regrowth for winter use by wildlife. Alternative B would remove the unused FS horse pasture fence in the East Zimmer Pasture and allow livestock grazing, and relocate the temporary water tank, when used, on the Lower Bear Pasture.

Porcupine Allotment
The Porcupine Allotment currently uses a Holistic Management (HM) team approach, which has been in effect since 1988. The allotment totals 9,858 acres and utilizes 12 pastures by planned

grazing from 06/09 to 09/30 and averages 334 cattle (cow/calf with some yearlings) and an average 1,652 AUMs. Variable numbers and season allowed each year for this HM allotment. Existing structural improvements include three vertical wells, five spring developments, 19 ponds, eight water tanks, nine miles of pipeline, and approximately 34 miles of fence.

Alternative B would continue the existing HM grazing system and permitted average AUMs.

It also proposes to: 1) bury all existing exposed pipelines for protection from wildfire, equipment, and sunlight damage; 2) reconstruct exclosure of North Antelope Springs; 3) provides the option for the HRM Team to incorporate pasture rest when needed; and 4) may graze early to treat any noxious weed infestation on a case by case situation. Grazing would generally be conducted early or late season in the Signal and South Exchange Pastures to favor consumption of noxious weeds.

Redfern Allotment
The 11,573 acre Redfern Allotment utilizes a five pasture deferred rotation system from 06/11 to 10/25, currently using 195 cow/calf pairs at approximately 1,159 AUMs. Existing structural improvements include six spring developments, 26 ponds, three water tanks, and approximately 18 miles of fence.

The total permitted use under Alternative B would be the equivalent of 177 cow/calf pairs, down from 195 due to a recent permit waiver. The remaining 18 permitted cattle were not waived, so those 18 will not be re-issued at this time. There is a concern that forage is limiting on this allotment, and benchmark trends are not meeting or moving towards desired conditions. This alternative would maintain the existing structural improvements. It would also relocate or reconstruct two water sources in the west central, upland portion of the Slate Creek Pasture, remove a defunct water development located approximately 0.75 miles east of Queen Bee Mine property on the Queen Bee Pasture, and determine if the horse pasture is necessary and resolve maintenance issues, also on the Queen Bee Pasture.

Rimmer Allotment
The Rimmer Allotment includes 2,011 acres split between two pastures operating from 06/11 to 10/10, currently using 33 cow/calf pairs and approximately 175 AUMs. Existing structural improvements include one spring development, two ponds, and approximately five miles of fence.

Alternative B would modify the allotment by incorporating the underutilized West School Pasture from the Slate Prairie Allotment into the Rimmer Allotment to form a third pasture. The number of days would be reduced to lessen the duration of use in the Rimmer Pasture. Initially, the Rimmer Pasture use would be reduced by 10 days and the Grandad Pasture reduced by four days. These reductions would be made up by the added West School Pasture. The allotment would increase in size by approximately 77 acres with the addition of the West School Pasture.

Alternative B would reconstruct the exclosure at Lost Park Springs and repair two gates along the Deerfield Trail 40.

Slate Prairie Allotment
The existing 5,896 acre allotment is managed using a five pasture deferred rotation system from 06/01 to 10/20 currently using 200 mature cattle (cow/calf) at approximately 1,232 AUMs.

Existing structural improvements include 23 ponds, three water tanks, and approximately 13 miles of fence.

Alternative B would modify current management by removing the West Slate School Pasture and adding it onto the existing Rimmer Allotment since it is underutilized by Slate Prairie permitted cattle, and always grazed late in season. Use with the Rimmer Allotment (same permittee) would allow for variation in season of use. This change would reduce the Slate Prairie Allotment by 77 acres and two days of use. Alternative B would maintain existing structural improvements, except as noted below where reconstruction or removal would be required.

Reconstruction or removal of existing improvements include the following: reconstruct fence to protect spring from trampling in the north end of the Mystic Pasture; reconstruct spring exclosure in lower Daugherty Gulch; rebuild approximately 0.20 miles of drift fence in Crooked Creek at the junction with Castle Creek; and remove a remnant exclosure in the drainage east of Crooked Creek draw that is overgrown with brush and trees - all on the Whitetail Pasture; and use rock to reinforce the pond spillway on the Slate School Pasture.

Tigerville Allotment

The existing 5,825 acre allotment is managed using a six pasture deferred rotation system from 06/01 to 10/25 currently using 112 cow/calf at approximately 715 AUMs. Existing structural improvements include: four spring developments, 19 ponds, and approximately19 miles of fence.

Alternative B would combine two pastures (Westside and Lena) and incorporate 80 acres, a portion isolated from the adjacent allotment.

Under Alternative B, the Lena and West Side Pastures would be combined and the common fence separating the two pastures would be removed. The fence is no longer functional and not needed for proper management. An existing spring exclosure fence would be reconstructed and enlarged in the northeast corner of the Tigerville Pasture. A portion of the Newton Fork Allotment east of Deerfield Road would be incorporated into the existing Mini Pasture. The Mini Pasture would be grazed once a year with either the Tigerville or Redfern Pasture for approximately 20 days per year or less. An existing water point access to Slate Creek in the Deer Park Pasture would be armored with gravel and rock. The old corral in the Marshall Pasture would be rebuilt into a small holding corral for removal of strays or injured livestock. Old corral materials would be removed.

ALTERNATIVE C

Common to All Allotments

Alternative C is designed to maintain or improve resource conditions using a full suite of options, including construction of new structural improvements such as fences, cattleguards, and water developments. Existing improvements would be maintained or reconstructed, as needed. New “core” structures - those required under Alternative C - are intended to provide better resource protection, get better livestock distribution, and reduce the potential for livestock-vehicle collisions along higher speed roads. It also includes adaptive options to construct improvements if determined necessary after other measures are implemented. These adaptive improvements might not ever be constructed, but are considered here to provide flexibility in case they are needed. As with Alternative B, reconstruction activities are generally expected to occur within a 3-5 year timeframe.

New structural improvements are generally expected to occur in 1-3 years. Adaptive improvements are more likely to be constructed in 5-10 years, if at all. Many or most may never be constructed. New and adaptive structural improvements, and those that need to be maintained or reconstructed, are presented by allotment in Appendix F.

Some tools for effecting change in condition and trend include the construction of new structural improvements to restrict and distribute livestock use, adjusting the timing and duration of livestock use, and moving to the next pasture before allowable proper use by weight guidelines and/or riparian stubble height requirements are exceeded. The permittee's primary methods may be: 1) strategic salt and/or supplement placement, 2) range riding to influence animal behavior by working the livestock, and 3) culling animals that do not range out from riparian areas. The purpose of using these methods is to achieve grazing efficiency, and reduce adverse effects on soils, riparian areas, and upland vegetation within the allotments that have specific areas that are not meeting desired conditions.

Bald Horse Allotment

Alternative C incorporates all the provisions of Alternative B. It also includes new structural improvements to improve riparian and other resource conditions, better livestock distribution, and removing livestock access from high speed roads. In total, this alternative proposes construction of approximately three miles of fence and four water developments.

New structural improvements include constructing a small corral for stray round-up in the southeastern portion of the Lower Victoria Pasture, fencing off a pond and piping water to a tank in south half of the West Horse Pasture, and developing an alternative water source in the northwest portion of the Middle Victoria drainage to better distribute livestock. It would also require constructing approximately 2.5 miles of fence to restrict cattle from the Sheridan Lake Road ROW, Spring Creek and associated riparian area, and trailhead. A water source would be developed within the draw along Burnt Ranch Pasture to replace loss of access to Spring Creek.

Alternative C also includes some adaptive options for structural improvements if resource conditions warrant their construction. This includes developing additional sources of water to better distribute livestock in the east side of the Middle Horse, North Bald Hills, and in the Lower Victoria Pastures. The spring source along FSR 677 at the common boundary with Redfern Allotment might also be developed for joint use. Other adaptive actions might be to reconstruct on a different alignment with the west boundary of the West Horse Pasture. Also, the spring on the north side of the Middle Bald Hills Pasture against private property might require further protection (USDA, Forest Service, Quimby, 2006, 2007).

Deerfield Allotment

Alternative C includes the provisions contained in Alternative B, and also would eliminate use in the Lake Shore Pasture, thereby becoming a five pasture deferred rotation system. This would reduce actual use by six days on the allotment. Additional fencing would be constructed off the existing Gold Run boundary fence to one new cattleguard on the Ditch Creek Road (both on the north end of the pasture) to prevent livestock access to highway. Additional fencing would be constructed along the ridgeline between the Trap Pasture and Baseline Pasture boundary. An adaptive option that might be employed is constructing over four miles of fence to protect the Heely Creek riparian area, but is not likely to occur as the initial cost is very high.

Palmer Gulch Allotment
Alternative C would continue the split of this allotment between north and south, and would formalize the separation by dividing it into two distinct allotments (north half would become Oblivion, south half would be Palmer Gulch). Maintenance, reconstruction, and removal of existing improvements would occur as presented in Alternative B. New structural improvements would be required under this alternative, and adaptive structures are included that might or might not be constructed in the future depending on need. There are also changes in some use and pastures as compared to Alternative B. Alternative C includes an adaptive option for constructing fences or otherwise excluding livestock use within the Norbeck Wildlife Preserve, if needed, to provide for game animals and birds.

North Half Palmer Gulch Allotment
Alternative C would operate on four pastures instead of the currently permitted five. The Sawmill Pasture is currently not grazed due to lack of private land line fencing. It would be used only for trailing livestock west of Pink Cabin Road and east of the Dump Pasture. The Dump Pasture, currently in non-use status, would be authorized for use after the permittee works with the 1880 Train to install cattleguards to prevent cattle access along the train ROW (Alternative B does not authorize the cattleguards). Alternative C would operate on a four pasture deferred rotation system utilizing the existing Keystone, Ford, Dump, and Samalias Pastures. Non use of the Sawmill Pasture would result in a reduction equivalent to 20 days of use on the allotment.

New structural improvements to be constructed on the Keystone Pasture include fencing off cattle access to Old Hill City Highway and Palmer Creek with approximately one mile of fencing north of railroad ROW and installing one new cattleguard on Twin Springs Road, and building a water development in the southern end of the pasture. A ditch would be re-contoured and reseeded near the Battle Creek drainage on the Ford Pasture. Alternative C contains an adaptive option for constructing approximately one mile of fence to exclude livestock use in the Norbeck Wildlife Preserve in the Ford Pasture. On the Samalias Pasture, livestock access would be fenced off to protect willows and a spring source located west of Samalias Trailhead, while providing a water access point for livestock; and an exclosure would be constructed around willows and a spring source located north of Rustic Ridge Guest Cabins. Approximately one half mile of fence would be built to prevent livestock use to Spring Creek in two locations.

South Half Palmer Gulch Allotment
Existing pastures would continue to be used on the South Half Palmer Gulch Allotment, except for the occasional winter use adjacent to private land on the Summit Pasture. Structural improvements would be made within the Norbeck Wildlife Preserve to improve conditions for game animals and birds. Otherwise, provisions for Alternative C would be similar to those of Alternative B. This includes the provision that no use would be allowed in the Palmer and Sunday Pastures before June 15 to avoid conflicts with bighorn sheep lambing use; and livestock would be removed from these pastures around August 1 to allow grass/forb regrowth for winter use by wildlife.

Grazing would be eliminated on the 20 acre incidental use on-off winter use Summit Pasture. Approximately one half mile private landline fence would be constructed to accommodate this change. The Summit Pasture would be combined into the Rabbit Pasture after the fence is constructed. A livestock exclosure would be constructed around the Fender Place pond and spring to

meet Norbeck goals and objectives on the Rabbit Pasture; and an exclosure fence would be constructed around the spring in the north end of the East Zimmer Pasture. The Forest Service would install steel plates to raise the water table to reduce erosion and fill incisions in the Palmer Pasture.

Adaptive options that might be pursued, if needed, would be to provide off-site temporary water tanks in drought years on the Rabbit Pasture, and fencing off riparian access to livestock if moving a temporary water tank in the Lower Bear Pasture is not effective in reducing impacts. For both the Lower and Upper Bear Pastures, an adaptive approach might be to increase pasture size to spread out grazing use by constructing approximately two miles of new fence on the east end of pastures. This would also re-locate one cattleguard and install a new cattleguard on each of these pastures. Alternative C contains the provision for constructing fence or otherwise excluding use within the Norbeck Wildlife Preserve if needed to provide for game animals and birds. This fencing could be approximately three miles in length and would reduce grazing on the Rabbit, Sunday, and Palmer Pastures.

Porcupine Allotment

This alternative would continue with the HM planned grazing as proposed in Alternative B. It would also require construction of new structural improvements and provide the option to construct additional improvements if needed for resource management purposes. Required improvements include construction of a fence to exclude livestock from Wells Spring in the Wells Cabin Pasture, construction of a fence to exclude livestock from The Seeps in the South Wolf 1 Pasture, and construction of approximately 1.75 miles of pasture boundary fence to better control livestock and regulate animal impact in the Babbington-South Wolf 1 Pasture. It also includes installation of new water storage and water tanks in the northeast side of the Wildcat-North 1 Pasture. Approximately 0.75 miles of new pipeline would be extended from the Babbington Pasture to the new water development.

Alternative C includes a number of adaptive options to construct additional improvements, if needed, in keeping with Holistic Management objectives. This includes constructing approximately 1.7 miles of cross-fence to split the Antelope Springs Pasture in half on an east/west axis, along with a cattleguard on FSR 283; and constructing approximately one mile of cross-fence to split the South Wolf 1 Pasture in half on a north/south axis, along with a cattleguard on FSR 284. Adaptive options for the Wildcat-North Pasture consists of 0.60 mile of temporary fence in the middle of the pasture to exclude livestock from the Wildcat Quarry, if it is developed; and increasing watering locations in the Signal Pasture by constructing 1.7 miles of new pipeline to two new water storage tanks, and add two new water tanks on the north and east sides of the pasture. Additional watering locations might also be desirable in South Exchange Pasture and would include constructing approximately one mile of new pipeline to a new water tank on the north side of the pasture. If the permittee's negotiated access to facilities on Cooper Ranch (State property) were terminated by land owner, an option would be to locate and construct a small corral for loading and unloading livestock on NFS lands on the South Exchange Pasture. Some temporary fencing might be used to confine livestock on the Yount Pasture and an option exists to add approximately 1.2 miles of new pipeline on the West Hells Canyon 1 Pasture.

Approximately 5,300 acres of prescribed broadcast burning is proposed under this allotment to reduce fuel loading buildup from dead and down pine trees and improve forage and browse.

Redfern Allotment
This alternative also displays the anticipated change in the number of cow/calf pairs from 195 to 177, as included in Alternative B. It also would maintain existing improvements and reconstruct or remove structural improvements as presented in Alternative B. In addition, Alternative C would require construction of some range improvements, and combine the Redfern Holding Pasture with a newly fenced off portion of the Slate Creek Pasture. Specifically, Alternative C requires fencing off approximately one mile of Slate Creek along FSR 530 to Slate Creek Dam by building approximately 1.5 miles of new fence, and installing one cattleguard in FSR 530.1c where the fence crosses the road. The riparian acreage fenced off from the longer duration Slate Creek Pasture would be incorporated into the shorter duration Redfern Holding Pasture. Grazing would increase by two days in the Redfern Holding Pasture after the fence is constructed.

Rimmer Allotment
This alternative would incorporate the changes in pastures and slight increase in size for the Rimmer Allotment as proposed in Alternative B. It would also continue maintaining the existing improvements on the allotment. Refer to Alternative B description.

Alternative C includes some adaptive options and additional construction, if needed, to meet desired resource conditions or other purposes. Some of these options are made possible because the current permittee also runs on the adjacent Slate Prairie Allotment. Possible new construction includes extending existing fencing or connecting segments up to 1.75 miles long if livestock stray off the north and east boundaries of the Rimmer Pasture. Another option would be to increase the size of the West School Pasture by adding the west third of Slate School Pasture (estimated 120 acres) from the Slate Prairie Allotment into the Rimmer Allotment. This would require installation of one cattleguard on NFSR 188 to control livestock. It also could be managed as a separate pasture within the Rimmer Allotment, and called the “188” Pasture. An existing, non-functional water development in the northeast corner of the pasture would need to be reconstructed. Another adaptive option may be to create a fourth additional pasture called the “187” Pasture. While the probability of implementing this option is low because of cost, it might be considered. It would require the installation of one cattleguard and approximately 0.60 miles of new fence at T1N R3E S15 NWSESE. This action would split off an estimated 500 acres from the Rimmer Pasture. Additionally, access to a possible water source in the southeastern corner of the Rimmer Pasture would need to be reconstructed.

Slate Prairie Allotment
This alternative would incorporate the changes in pastures and slight reduction in size for the Slate Prairie Allotment as proposed in Alternative B. It would also complete the same reconstruction of needed improvements and removal of unneeded improvements. Refer to Alternative B description.

In addition, Alternative C includes some adaptive options for additional construction, if needed. This includes development of the Browner Spring with the Bittersweet Allotment permittee (located on the west side of this pasture) and constructing up to 0.5 miles of drift fencing on the north boundary of this pasture to keep livestock within assigned area in the Whitetail Pasture. Another option is to expand protection of Daugherty Gulch’s existing spring exclosure in the Hay Draw Pasture to improve the distribution of age classes of willows in this drainage. Another option

would be to fence off a pond to livestock access, and pipe water to downstream stock water tank in the Slate School Pasture.

Tigerville Allotment
This alternative would incorporate the changes in pastures and slight expansion in size proposed by Alternative B, and would complete the same reconstruction of needed improvements and removal of unneeded improvements. Refer to Alternative B description.

In addition, Alternative C includes some adaptive options for additional construction if needed to meet desired resource conditions or other purposes. This includes construction of protective fencing around breeched beaver dams and willow remnants in the southeast corner of the West Side Pasture. Also possible is construction of up to one third of a mile of highway ROW fencing off the southwest corner of the Mini Pasture. This fence would add approximately 80 acres to the pasture. An adaptive option for construction of a small corral may need to be exercised if use of a private, off NFS lands corral is no longer allowed in the Redfern Pasture. An exclosure may need to be constructed around a fen area located north of Gooseberry Trailer Park in the Deer Park Pasture.

The public and decision maker can make a relative comparison between the alternative effects on the key issues based on measurement indicators developed for each issue. Table 0-1-1 provides a comparative display of the alternative effects and/or outputs relative to the key issues in the Mystic Range Project Area.

Table 0-1-1 Comparison of Alternatives

	Alternative A (No Action)	Alternative B	Alternative C (Proposed Action)
Implementation Schedule	Implemented two years after decision.	Implemented immediately upon decision.	Implemented immediately upon decision. Required improvements 1-3 years, other adaptive measures as needed (5-10 years).
Grazing	No Grazing. Permits cancelled in two years.	Grazing re-authorized on all eight allotments.	Grazing re-authorized on all eight allotments.
Water Developments (Springs, Ponds, Tanks, Wells)	All removed by Forest Service except those that benefit wildlife.	Existing structures to be maintained or reconstructed as needed.	Existing structures to be maintained or reconstructed as needed similar to Alternative B. A total of 11 new water developments to be constructed.
Fences (miles)	All removed except for those that benefit wildlife.	Existing fences to be maintained or reconstructed as needed.	Existing fences to be maintained or reconstructed as needed similar to Alternative B. Approximately 14 miles of new fence to be constructed.
Streams / Riparian			
Soils	Eliminates all livestock effects to soils.	Soil compaction would remain well within Forest Plan standards.	Slight increase in soil compaction, but would remain well within Forest Plan standards.
Water Quality	Eliminates all livestock effects to water quality.	Water quality standards relating to beneficial uses would be maintained.	Similar to Alternative B
Streambank Stability	Streambanks would gradually stabilize.	Streambank stability would be maintained or improved, but at a slower rate than Alternative A.	Similar to Alternative B, except in those limited areas where livestock are excluded from riparian areas by new structural improvements. Streambank

	Alternative A (No Action)	Alternative B	Alternative C (Proposed Action)
			stability in those limited areas would be expected to improve similar to Alternative A.
Riparian Vegetation	Gradual recovery and expansion of riparian vegetation.	Recovery and expansion of riparian vegetation would be expected to occur at a slower rate than Alternative A	Similar to Alternative B, except in those limited areas where livestock are excluded from riparian areas by new structural improvements. Riparian vegetation in those limited areas would be expected to recover and expand similar to Alternative A.
Upland Vegetation			
Bare Ground	Bare ground would gradually decrease.	Bare ground would decrease, but at a slower rate than Alternative A.	Similar to Alternative B.
Noxious Weeds and Non-Desirable Plants	Noxious weeds and non-desirable plants would remain unchanged.	Noxious weeds and non-desirable plants may gradually decrease compared to Alternative A.	Similar to Alternative B.
Desirable Plant Species Diversity	Desirable plant species may gradually increase in diversity and abundance.	Desirable plant species diversity and abundance would gradually increase, but at a slower rate than Alternative A.	Similar to Alternative B.
Social/Economics			
Risk of Livestock-Vehicle Collision	Eliminated	Same as current risk.	Substantially reduced risk.
Potential For Actual Grazing Use Reduction	Total elimination of grazing.	Bald Horse: Low Deerfield: High Palmer (North): Moderate Palmer (South): Moderate Porcupine: Low Redfern: High Rimmer: Moderate Slate Prairie: High Tigerville: Low	Similar to Alternative B, except reductions in actual use, where it occurs, may be less because of better livestock distribution and exclosures.
Cost to Permittees	Standard operation and maintenance costs (including grazing fees) for two years. Substantial replacement costs for cancelled grazing permits.	Standard operation and maintenance cost (including grazing fees) along with reconstruction of some existing improvements.	All costs included in Alternative B plus an approximate $175,000 in new improvements (fences, water developments, cattle guards).
Cost to Forest Service	Cost to administer for two years, costs to remove unneeded improvements, and the cost to maintain retained structures for wildlife.	Standard administration costs plus additional $57,000 in long-term monitoring costs over ten year period.	Similar to Alternative B.

The Mystic Range Project purpose and need (see Chapter 1) provides the focus and scope of the proposal as related to National and Forest level policy and direction. Given the purpose and need, the Deciding Official (District Ranger) reviews the proposed action, the issues identified during scoping, the alternatives, and the environmental consequences of implementing the proposal and alternatives disclosed in the EIS. This forms the basis of the Deciding Official to make the following determinations:

- Whether or not the proposed activities and alternatives address the issues, are responsive to National policy/guidance/law and Forest Plan direction, and meet the purpose and need for action in the Mystic Range Project Area.
- Whether or not the information in this analysis is sufficient to implement proposed activities.
- Which action, if any, to approve (decide which alternative or mix of activities to implement).
- Whether there is a need for site-specific amendments to existing Forest Plan direction.

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Deerfield Allotment
Palmer Gulch Allotment
Porcupine Allotment
Redfern Allotment
Rimmer Allotment
Slate Prairie Allotment
Tigerville Allotment

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CHAPTER 1 PROPOSED ACTION and PURPOSE OF AND NEED FOR ACTION

DOCUMENT STRUCTURE

The Mystic Ranger District of the Black Hills National Forest has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into seven chapters followed by Appendices A – F.

Chapter 1. Proposed Action and Purpose of and Need for Action: The chapter includes information related to background of the project proposal, issues, the purpose of and need for the project, and a description of the agency's proposal for addressing that purpose and need. This section also details how the Forest Service involved the public, how the public responded and what issues were generated regarding the proposal.

Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the proposed action for achieving the stated purpose, as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This chapter also provides a discussion of design criteria and monitoring required. Finally, this section includes a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis documentation is organized by resource area, e.g., Range, Wildlife Habitat, Watershed and Soils, etc.

Chapter 4. Bibliography/References: The bibliography provides a list of references supporting the documentation in the EIS.

Chapter 5. Glossary: The glossary provides a list and explanation of key words, acronyms, and terminology used throughout the EIS.

Chapter 6. List of Preparers: This chapter provides a list of preparers involved during the development of the environmental impact statement.

Chapter 7. Index: The index references page numbers for many key document topics and words.

Appendices: The appendices provide more detailed information to support the documentation and analysis presented in the EIS.

Additional documentation, including more detailed analyses of project-area resources, may be found in the Project File located at Mystic Ranger District office in Rapid City, South Dakota.

BACKGROUND

Livestock grazing has been occurring on the Black Hills National Forest since the initial explorations of the Custer Expedition. In fact, the 1874 Black Hills Expedition included a prodigious number of cattle, horse, and mules to sustain the expedition. This was in addition to the native grazers of the time: bison, elk, deer, and bighorn sheep.

The following history of grazing in the Black Hills is excerpted from "Historic and Contemporary Use of Occupation of the Black Hills" (USDA Forest Service 1994a) compiled during the 1997 Forest Plan revision process. This excerpt provides insight on the nature and intensity of historical grazing impacts in the Black Hills and provides a social perspective for the vegetative range conditions found in the Black Hills today:

> "With the 1870s gold rush, needs for meat, vegetables, dairy products and fodder for people and animals moving in to the Hills heightened. Over the next two decades, industries grew out of cattle and sheep production, both within and outside of the Hills (Cassells et al. 1984).
>
> By 1888, as many as 600,000 cattle were concentrated in the Black Hills region. Estimates from 1903 placed cattle at 300,000 head, sheep at 100,000 and horses at 7,000 head (Cassells 1984). Plains ranchers also brought cattle into the Hills in the summer in search of grazing lands. Livestock numbers for this era are phenomenal given the number of cattle allowed today. Currently, 23,000 head of cattle graze on the Black Hills National Forest lands.
>
> Like other parts of the West, "range wars" erupted between sheep and cattle interests. Although Belle Fourche and Rapid City supported a thriving wool industry with wool warehouses used as hubs for wool exports, cattlemen lobbied hard to drive sheep from the Hills. ….After holding public meetings, (Gifford) Pinchot opted to close the Forest to sheep. He did so in large part to protect the Forest's timber reserves, which were being degraded by sheep that often destroy pine saplings. Sheep were again allowed on the Forest in 1916, "probably because the price of wool was up and the price of beef was down" (Geores 1993). Sheep grazing on Forest System lands in the Black Hills has occurred since, but not to the scale it had early this century and late last century.
>
> At the turn of the century, Forest Reserve regulations were adopted that favored small grazing permittee over leases to large companies. The Forest's administration felt that small operators would be better land stewards than large operators, who cared only for profits, and not the conditions their cattle operations created on the range (Geores 1993).
>
> Homesteading ceased for a time in the Black Hills as a result of the creation of the Black Hills National Forest Reserve in 1898. Those homesteads already established in the Hills were allowed to stay on. The Forest Homestead Act of 1906 dissolved the 1898 moratorium on homesteading on Forest Reserves.
>
> Homesteaders again arrived in the Hills. ….Since many of the lower-elevation areas had already been homesteaded, a number of people tried to homestead in the higher valleys

> and draws within the Black Hills. The usual pattern was to claim a homestead along a stream bottom, which included a long strip of land along the stream. This process along with those who filed mining claims, scattered parcels of private land in the public lands of the Black Hills National Forest. ….In some instances, small grains were produced on meadows that were cleared of rocks. Hay was gathered from natural grasses. Nearly all of these early homesteads have been abandoned or subdivided. Because of climate, successful homesteading above about 6,000 feet proved virtually impossible (Cassells et al. 1984).
>
> A major effort was made in the Custer area to promote dairy farms…sometime in the 1930s the carrying capacity for grazing land was reached. As many applicants for grazing allotments were turned away as were accepted, so the grazing resource, which had seemed nearly endless a couple of decades before had finally reached an official saturation point.
>
> By the early 1940s, some range land on the Forest was severely overgrazed. ….As a result, the Forest Service reduced the number of grazing permits to allow the land to recuperate. ….Grass and forb species were in poor condition on many areas of the Forest and deciduous vegetation, like willows, berry bushes and aspen had been damaged by overgrazing. Big game, especially deer, were impacted. ….Grazing permit cuts began again in 1951. ….Programs were implemented in the 1950s to improve range conditions, including rotational grazing systems and aerial spraying of weeds. These programs met with some success, and were undertaken cooperatively between the Forest Service and permittees."

Heavy grazing and agricultural development were not the only activities that have influenced vegetative components of the Black Hills. Other activities and programs have also contributed to the condition of uplands and riparian communities seen in the Hills today. The following experts from "The Range of Natural Variability for the Black Hills: A First Step" (USDA Forest Service 1994b) describes these effects over the last 100 years:

> "Forest Service management has led to a dramatic shift in forest conditions over the past 120 years. Today mature ponderosa pine appears to be considerably more dense and extensive that what occurred prior to settlement…."
>
> "The area of non-forested land has decreased since 1874. Much of this change can be attributed to a decrease in fire frequency. This has allowed ponderosa pine to encroach into dry meadows and some historically wet meadows that have drier soils resulting from lower water tables in streams that historically supported beaver dam complexes…."
>
> "Not only has forest maturation during the past century influenced tree species composition, but herbaceous and shrub species also have been affected. Herbaceous and shrub species as a group attain their best productivity in meadows, early forest seral stages, and the understory of aspen and open-canopy forests. In the Black Hills, the increase in the density and extent of mature ponderosa pine and, to a lesser extent, white spruce has resulted in a concomitant decline in herbaceous and shrub species abundance."

> "Riparian areas adjacent to low-gradient channels have probably been modified most since settlement began due to their accessibility. As described by early explorers, these ecosystems historically had saturated soils that supported phreatophytic (ie.e water dependent) plant communities. Beaver colonies were a critical link in maintaining the integrity of these wet-meadow systems. ….Beaver were heavily trapped by early settlers leaving only a few in remote places far away from settlements by 1887 causing a break in the natural cycle. The residual dam complexes failed or in many cases were breached by local landowners. This decline in beaver populations, along with other impacts to wet meadows such as draining, grazing, decreased fire frequency, and herbicide spraying resulted in lower water tables and a compositional shift to drier-site plants."

Thus over the last 100 years, there have been many social, economic, and ecological influences that have resulted in the vegetative communities that occur in the Black Hills today.

Livestock grazing is still an authorized use of National Forest System lands on the Black Hills (USDA Forest Service 1997). Goal 3 of the Black Hills Forest Land and Resource Management Plan (the Forest Plan) states: "Provide for sustained commodity uses in an environmentally acceptable manner." Commodities, including livestock, contribute to the economics of local and regional communities and support local people. Because sustained commodity production depends on sustainable ecosystems, the Forest Plan further directs that "….livestock grazing will occur without impairing the health of ecosystems and in a manner compatible with other Forest uses." These allotments are managed in close cooperation with the range permittees.

MANAGEMENT DIRECTION

The following sections provide an overview of the management direction applicable to the Mystic Range Project. A more detailed summary of management direction and associated management opportunities is located in Appendix E of this EIS.

Forest Plan Direction

The Black Hills National Forest programmatic management direction document is the 1997 Revised Land and Resource Management Plan (LRMP or Forest Plan), as amended by the Phase II Amendment (October 2005), and supported by the Final Environmental Impact Statement (FEIS) for the Phase II Amendment to the 1997 LRMP. The Forest Plan is required by the rules implementing the Forest and Rangeland Renewable Resources Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA).

The Forest Plan, as amended, provides revised and new standards and guidelines focused on: protecting communities, property, and forest values by reducing severe insect and fire hazards; conserving viable plant and animal species and habitats for the long term supported by the best available science; designating research natural areas; and providing for the continuing viability of the existing forest products and infrastructure.

The purpose of the Forest Plan (FP) is to provide management direction for multiple use and sustained yield of goods and services from National Forest System lands in an environmentally sound manner.

Moreover, the Forest Plan provides overall goals and objectives (FP Chapter I) as well as associated standard and guidelines (FP Chapter II) for management.

The Forest Plan establishes eleven multiple use goals and associated objectives for management of the Forest. Goals 1-4, 10 and 11 are directed toward natural resource objectives for multiple use management of the Forest. Also, Goal 3 and 5-9 provide socio-economic emphasis for management of the Forest. The goals and objectives, applicable to specific resource management issues needing resolution, provide the basic direction for defining the purpose and need and subsequently developing the project proposal. The eleven Forest Plan goals are discussed in Chapter I of the Forest Plan. The goals providing primary management emphasis and direction for the Mystic Range Project are **Goals 1-3:**

Goal 1: Protect basic soil, air, water and cave resources

- Irreversible soil losses and detrimental soil conditions would not exceed standards and guidelines.
- Riparian areas would support diverse plant species.
- Healthy riparian areas and stream systems would affect stream flow regime.
- Water conditions on the Forest would be of a quality and quantity to enable them to contribute to municipal water supplies, including those using the Madison Aquifer.

Goal 2: Provide for a variety of life through management of biologically diverse ecosystems.

- Habitat for Threatened and Endangered Species would be conserved.
- Habitat necessary for sensitive species would be conserved.
- Course woody material would be provided for forest productivity and wildlife species habitat.
- Forage, cover, and open road densities are key components and addressed at the project level.
- Uncommon communities would be conserved to maintain their ecological function.

Goal 3: Provide for sustained commodity uses in an environmentally acceptable manner.

- Emphasize long-term sustainable production of commodities for economies, communities, and people in an environmentally acceptable manner.
- Timber harvest and livestock grazing would occur without impairing the health of ecosystems and in a manner compatible with other Forest uses. Acres of land suitable and available for livestock grazing are displayed in Appendix I of the Forest Plan (USDA Forest Service 2006a).

See Appendix E 'Management Direction and Opportunities' for more information on the above goals, objectives and opportunities.

The Forest Plan also sets management allocations for specific uses of land (Management Areas) within the Forest to meet multiple use objectives (FP Chapter III). The Mystic Range Project ID Team reviewed Management Area (MA) direction and confirmed that no new information existed that would require reconsideration of Forest Plan resource allocations. The MAs designated in the Forest Plan for the Project Area are listed below, in Table 1-1 and also displayed in Appendix F.

MA 3.1 - Botanical Areas
MA 3.7 - Late Successional Forest Landscape

MA 4.1 - Limited Motorized Use and Forest Product Emphasis
MA 4.2B - Peter Norbeck Scenic Byway
MA 5.1 - Resource Production Emphasis
MA 5.4 - Big Game Winter Range Emphasis
MA 5.4A - Norbeck Wildlife Preserve
MA 8.2 - Developed Recreation Complexes

Table 1-1 Management Area Acres by Allotment

Allotment Name	Management Area Acres								
	3.1	**3.7**	**4.1**	**4.2B**	**5.1**	**5.4**	**5.4A**	**8.2**	**Total Acres**
Bald Horse	-	3,499	50	-	-	23,728	-	551	27,828
Deerfield	160	-	-	-	6,932	-	-	782	7,874
Palmer Gulch	-	-	3,439	302	8,386	36	2,027	-	14,190
Porcupine	-	-	-	-	6,421	3,437	-	-	9,858
Redfern	-	94	-	-	178	11,301	-	-	11,573
Rimmer	-	-	-	-	2,011	-	-	-	2,011
Slate Prairie	-	-	-	-	1,384	4,512	-	-	5,896
Tigerville	-	-	-	-	-	5,825	-	-	5,825
Total Acres	**160**	**3,593**	**3,489**	**302**	**25,312**	**48,839**	**2,027**	**1,333**	**85,055**

Other Direction

Norbeck Wildlife Preserve

The Norbeck Organic Act of June 5, 1920, authorized the establishment of the Custer State Park Game Sanctuary "for the protection of game animals and birds and to be recognized as a breeding place therefore." The sanctuary was officially established by proclamation on October 9, 1920, by President Woodrow Wilson. The name Custer State Park Game Sanctuary was changed to Norbeck Wildlife Preserve on October 6, 1949 (16 USC 675, 1998).

In the 1927 Master Plan for the Protection and Administration of the Preserve, the Forest Service detailed events leading to the establishment of Norbeck. The Plan explained that then-Governor Peter Norbeck of South Dakota "desired to add this feature [the presence of game] to the Custer State Park" (Master Plan, pg. 3). The Plan noted the Sanctuary had been withdrawn from mineral entry and homesteading, and then withdrawn again by the Act and Proclamation, and that "this second withdrawal is the dominant withdrawal." The Plan concluded that "preference will be given to the use as a game sanctuary and its use for such other purpose will be restricted or denied…." (Master Plan, pg. 11). The Plan went on to allow for timber removals from the area, continued special uses (summer homes) and grazing (Master Plan, pg 50).

Subsequent agency plans for Norbeck have followed the lead of the 1927 Master Plan in realizing that the primary use of Norbeck was for "game animals and birds", and that all actions in the Preserve were to benefit these species. Management plans drawn up in 1973, 1979, and 1989, and two generations of Forest Plans (1983 and 1997) have included grazing as suitable use. The current Forest Plan, as amended, provides direction for MA 5.4A. Permits may be reissued, but permitted livestock numbers are not to be increased. The Forest Service should take advantage of opportunities to transfer forage use from livestock to wildlife (pg III – 101

USDA Forest Service, 2006d). The Palmer Gulch Allotment contains approximately 14 percent (2027 acres) within the boundary of Norbeck (see Range section in Chapter 3 for further information).

Peter Norbeck National Scenic Byway

Established in 2001, the Peter Norbeck National Scenic Byway is a 70-mile corridor created to emphasize the scenic quality of the heart of the Black Hills granitic core. Portions of the Byway were designed by Peter Norbeck himself after searching the Harney Range for routes that would provide "the grandest view" and allow visitors to drive slowly and experience the area from their motor vehicles. The Byway is one of the major draws to the area and with its steep, winding route and pig-tail bridges, it leaves a lasting impression. Approximately three miles of the Palmer Allotment is within the Scenic Byway (see Range section in Chapter 3 for further information).

PURPOSE OF and NEED FOR ACTION

The purpose of this project is to re-authorize livestock grazing on all or part of the project area and to ensure livestock grazing occurs in an environmentally acceptable manner. The Forest Service rangeland allotment management process calls for periodic reviews of allotment conditions and management practices. All of these subject allotments are due for environmental review, and if necessary, revision to current rangeland management practices. This project will address Goals 1-3 of the Forest Plan – to protect basic soil, air, water, and cave resources; to provide for biologically diverse ecosystems; and to provide for sustained commodity uses, consistent with Forest Plan Standards and Guidelines.
The underlying needs for this proposal include:

- Improve livestock management so that it is consistent with the goals, objectives, standards, and guidelines of the Forest Plan, as amended.
- Improve species composition of upland vegetation.
- Improve streambank stability.
- Improve riparian vegetation diversity and abundance.
- Reduce opportunities for cattle conflicts with vehicle traffic.

DESIRED CONDITION

Desired condition is the specific condition of rangeland resources on a landscape that meets management objectives as identified in the Forest Plan. Desired condition is based on ecological, social, and economic considerations. Goal 2 of the Forest Plan describes the desired condition of lands and resources and also describes standards and guidelines for various resources that are intended to guide management into meeting or trending towards desired conditions. Appendix E includes Forest Plan direction that helped define the desired conditions for the Mystic Range Project.

Desired plant community (DPC) selection is crucial to effective rangeland planning. DPC is part of the overall desired condition developed by the interdisciplinary team. DPC's must currently exist in the general area in similar environmental settings, and are capable of occupying the site within a reasonable time period through management changes (R2 Rangeland Analysis and

Management Training Guide, USDA Forest Service 1996a). The ID Team has observed that much of the primary grazing areas in the Mystic Range Project area have been converted to non-native graminoid species through historic management practices.

For example, numerous meadows were planted with timothy and/or smooth brome and managed as hay grounds (Graves, 1899; MacIntosh, 1928). These species have naturalized and easily spread to adjacent areas (Larson and Johnson 1999). It is not feasible for these areas to return to a "natural" state without major effort and expense. Many of these non-native species are acceptable for the current and proposed management of the project area. The following species are considered acceptable: *Phleum pretense*, timothy; *Bromus inermis*, smooth brome; and *Poa pratensis*, Kentucky bluegrass.

While it is not the goal or objective of this project to solely manage for these non-native grass species (Table 1-2 Desired Conditions for Vegetative Communities), reducing them through grazing management may be applicable. The purpose of reducing their presence is to increase the presence of native plants. While non-native species are not as desirable for wildlife habitat and rangeland health on public lands as native species, they do provide some benefits (SAIC 2003). These non-native species were first used for livestock forage, hay, and erosion control because of their ability to compete and their aggressive nature. The overall desired condition for the project area that was developed by the ID Team is described in Table 1-2.

Table 1-2 Desired Conditions for Vegetative Communities within the Project.

Community Type	Desired Conditions
Upland Grasslands	Mixed native grass and forb communities provide a diverse mosaic of plant species, a variety of vegetative structures, and effective ground cover (not more than 5-15% bare ground depending on soil type) to maintain soil stability and provide wildlife habitat. Maintain quality of desired plant communities by managing for native species. Primary native graminoid species may include: *Nassella viridula* (green needlegrass), native wheatgrasses, *Carex filifolia* (threadleaf sedge), and *Koeleria macrantha* (prairie junegrass). Acceptable non-native species may include *Poa pratensis* (Kentucky bluegrass), *Bromus inermis* (smooth brome), and *Phleum pratense* (timothy). Forb species may include *Vicia americana* (American vetch), *Achillea millefolium* (common yarrow) *Trifolium* spp. (clovers), and *Taraxacum officinale* (dandelion). Noxious weeds and invasive plants should be less than 2% of the species composition. In high quality endemic Black Hills Montane Grassland communities, maintain diversity and canopy cover of native signature species which may include *Stipa richardsonii* (Richarson's needlegrass), *Sporobolis heterolepis* (prairie dropseed), *Geum triflorum* (prairie smoke), *Solidago* spp. (goldenrod), and *Potentilla* spp. (cinquefoil).
Riparian Communities (Including Seeps & Springs)	Maintain riparian plant communities that provide overhanging vegetation and effective ground cover to help trap sediment and dissipate energy during peak flows, protect soils from erosion

Community Type	Desired Conditions
	processes, maintain stream bank stability and reduce alteration, and effective ground cover (not more than 5-10% bare ground depending on soil type) and provide wildlife habitat. Plant species may include *Carex* spp. (sedges), *Juncus* spp. and *Scirpus* spp. (rushes), and desirable riparian grass species (ex: *Glyceria* spp. (mannagrass), and *Calamagrostis canadensis* (bluejoint reedgrass)). In shrubland systems, plant species may include black hawthorn and *Salix* spp. (willows). Tree species may include *Betula papyrifera* (paper birch), *Betula occidentalis* (water birch), *Acer negundo* (boxelder), *Quercus macrocarpa* (bur oak) *Cornus sericea* (redosier dogwood), and *Picea glauca* (white spruce). Class structure in willow communities should have a distribution of age classes. New shrubs are establishing and are increasing in size and cover. Stream banks should be rated mostly stable (equal to or greater than 74% of all measured banks). High quality habitat for sensitive species would be maintained in the McIntosh Fen; livestock grazing is not authorized in the Fen at this time.
Aspen	In landscapes with multiple aspen clones, maintain aspen communities with diverse age structures including old growth communities, regeneration, openings, standing snags and down woody debris across aspen areas: vigorous and diverse native grass and forb understory present. Aspen shoots are present and develop into saplings over time.
Ponderosa pine	Maintain diverse understory of native grasses including *Nassella viridula* (green needle grass), native wheatgrasses, *Carex inops* ssp. *heliophila* (sun sedge), *Schizachyrium scoparium* (little bluestem), and *Koeleria macrantha* (prairie junegrass). Maintain effective ground cover (not more than 10% bare ground) to maintain soil stability and provide wildlife habitat. Acceptable non-native species may include Kentucky bluegrass, smooth brome, and timothy. Forb species may include *Vicia americana* (American vetch), *Achileia millefolium* (common yarrow), *Trifolium* spp. (clovers), and *Taraxacum officinale* (dandelion). Noxious weeds should be less than 2% of the species composition.
Botanical Areas (MA 3.1) & Sensitive and SOLC Plant Occurrences	Maintain current extent of known sensitive and SOLC plant occurrences. Impacts by livestock (utilization, trampling, trailing) on sensitive and SOLC plant species and suitable habitat would be incidental. Vegetation, habitat, soil productivity and water quality are generally not impacted by livestock since their use is not authorized at this time in the McIntosh Fen.

PROPOSED ACTION

The Proposed Action, Alternative C, is designed to maintain or improve resource conditions using a full suite of options, including construction of new structural improvements such as fences,

cattleguards, and water developments. Existing improvements would be maintained or reconstructed, as needed. New "core" structures - those required under the Proposed Action - are intended to provide better resource protection, get better livestock distribution, and reduce the potential for livestock-vehicle collisions along higher speed roads. It also includes adaptive options to construct improvements if determined necessary after other measures are implemented. These adaptive improvements might not ever be constructed, but are considered here to provide flexibility in case they are needed. Reconstruction activities are generally expected to occur within a 3-5 year timeframe. New structural improvements are generally expected to occur in 1-3 years. Adaptive improvements are more likely to be constructed in 5-10 years, if at all. Many or most may never be constructed. New and adaptive structural improvements, and those that need maintained or reconstructed are presented by allotment in Appendix F.

For all allotments: livestock would be moved by the permittee when proper use criteria for upland rangelands and riparian areas are reached and before continued use would exceed standards and guidelines. Adaptive Management Options that may also be considered are displayed in Table 2-1.

Refer to "Alternatives Considered in Detail" in Chapter 2 of this document for a detailed description of the Proposed Action and other Alternatives.

DECISION FRAMEWORK

The Mystic Range Project purpose and need provides the focus and scope for the proposal as related to the programmatic goals of the Forest Plan and the Phase II Amendment. Given the purpose and need, the Deciding Official (District Ranger) reviews the proposed action, the issues identified during scoping, the alternatives, the environmental consequences of implementing the proposal and alternatives, and public comments on the Draft EIS.
This forms the basis for the Deciding Official to make the following determinations:

- Whether or not the proposed activities and alternatives address the issues, are responsive to National policy/guidance/law and Forest Plan direction, and meet the purpose and need for action in the Mystic Range Project Area.
- Whether or not the information in this analysis is sufficient to implement proposed activities.
- Which action, if any, to approve (decide which alternative or mix of activities to implement).
- Whether there is a need for site-specific amendments to existing Forest Plan direction.

If any action alternative is selected, project implementation could begin as early as the Fall 2010.

PUBLIC INVOLVEMENT

During project development and analysis period, an effort was made to involve, interact, and cooperate with individuals and groups interested in the Mystic Range Project. Part of this effort included public scoping as discussed below.

Scoping is the process of obtaining public comments about proposed federal actions to determine the breadth of issues to be addressed. Comments on the proposed action, potential concerns, and

opportunities for managing the Mystic Range Project Area were solicited from members of the public, American Indian Tribes, other public agencies, organizations, and Forest Service specialists.

A scoping letter was mailed to approximately 91 interested parties, on June 5, 2009. This letter included a description of the project area, and a general explanation of the actions proposed, and an invitation to comment. During the public scoping period and throughout the project development and analysis period an effort was made to involve and interact with individuals and groups interested in the Mystic Range Project.

Some key interest groups consulted with and/or involved in the planning process were the South Dakota Game, Fish and Parks, members of the Holistic Management Team, and the eight allotment permittees. An effort was made to engage in consultation regarding the project with Tribal contacts known to have interest in management of the National Forest.

The project was entered into the Schedule of Proposed Actions (SOPA) in February 2009. SOPA contains a list of Forest Service proposed actions that will soon begin or are undergoing environmental analysis and documentation. It provides information so the public can become aware of and indicate interest on specific proposals (www.fs.fed.us/sopa).

The Notice of Intent (NOI) to prepare an EIS was published in the *Federal Register* on Friday, June 12, 2009. This provided official notification that the public comment period for the Mystic Range Project Area would last for 30-days concluding July 13, 2009. During the scoping period, the Forest Service received considerable public response supporting the proposal and rationale for action.

A Notice of Availability (NOA) for the Mystic Range Project DEIS was published in the *Federal Register* on April 9, 2010. This initiated the official 45-day comment period on the DEIS. This comment period ended on May 24, 2010. A legal notice was published in the Rapid City Journal on April 9, 2010.

During the DEIS comment period, 17 individuals, groups, or agencies submitted comment letters, 157 responses were identified and responded to by the Mystic Range ID Team. These comments and associated agency responses are located in Appendix A of this Final EIS.

No public comment on the DEIS generated the need for reanalysis of alternatives. Additional discussions and/or factual and clarifying information have been incorporated in the document.

ISSUES

This section provides a summary of issues identified during the public and internal scoping period for the Mystic Range Project. Comments received during scoping were used to help in defining issues, develop alternatives and mitigation measures, and analyze effects. A total of 177 comments were received via letters, facsimiles, personal-delivery, or email during the formal scoping process. Through review and analysis of scoping comments and input, the Mystic Range Project Core ID Team identified three prevailing or key issues related to the proposed activities. Comments received and the agency ‘response to comments’ are summarized in the Mystic Range Project File located at the Mystic Ranger District, Rapid City office.

The ID Team reviewed input submitted during the scoping period and separated the issues into significant [as directed by the Council of Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)] and non-significant issues. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues are defined as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made ; or 4) conjectural and not supported by scientific or factual evidence. The Council of Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-significant issues and rationale regarding their categorization as non-significant may be found in the project record. A brief description of the three key issues follows below.

A concern raised during the scoping period was the effect of grazing on wildlife, specifically for those species that utilize or depend on primarily on riparian, but also upland plant communities. Effects of livestock grazing on wildlife was not included as a significant issue because those effects are largely a function riparian and upland vegetation conditions, and these resources are included in the three main issues. Even though wildlife is not listed as a significant issue, this EIS includes substantial information on the effects of grazing to wildlife (see Chapter 3).

A brief description of the three key issues follows below. Following each key issue category below is a list of issue measurement indicators. Use of measurement indicators applicable to the respective issues provides a means to make a relative comparison between each alternative based on their effects on each issue.

1. Soil and Water/Stream/Riparian

Comments received during scoping and internal review indicate a concern that livestock have adverse impacts to soil and water, streams, and riparian areas. Specifically, there are concerns that livestock grazing results in compacted soils, lowered water quality from livestock use in and near streams, trampling of stream banks with associated bank alteration and stream bank destabilization, and loss of riparian habitat and vegetative diversity.

The Proposed Action is designed to reduce livestock grazing effects on soils, water, stream, and riparian resources. It includes a new riparian stubble height requirement that would limit the amount of time livestock spend within riparian areas and next to streams, builds fences to exclude livestock from some riparian/stream/spring areas and obtain better distribution, and constructs water developments in the uplands to encourage cattle use away from streams and riparian vegetation. It also includes new long-term effectiveness monitoring along stream/riparian habitat to determine if these actions are successfully maintaining or moving towards desired resource conditions, along with stricter requirements if the proposed actions are not being effective.

Measurement Indicators for Soil and Water/Stream/Riparian:

- Soil compaction
- Water quality
- Streambank Stability
- Riparian vegetation

2. Upland Vegetation

Comments received during scoping and internal review indicate a concern that livestock have adverse impacts on upland vegetation. Specifically, there are concerns that livestock grazing would result in areas of bare ground devoid of vegetation, increased noxious weed infestations, and lack of native and desirable non-native vegetation species.

The Proposed Action is designed to reduce effects of livestock grazing on upland vegetation. It requires movement of livestock before reaching upland utilization standards, construction of fences and water developments to gain better livestock distribution, and utilizes livestock as appropriate to reduce weed infestations in combination with other integrated pest management options. It also includes new long-term effectiveness monitoring of upland vegetation to determine if these actions are successfully maintaining or moving towards desired resource conditions, along with stricter requirements if the proposed actions are not being effective.

Measurement Indicators for Upland Vegetation:
- Bare ground
- Noxious weeds and undesirable plants
- Desirable upland plant species diversity

3. Social/Economics

Comments received during scoping and internal review indicate a concern about economic effects on permittees and the Forest Service from livestock operations on the allotments, and concern about the risk to livestock-vehicle collisions along high speed roads. Specifically, there are concerns that any changes in operating standards and costs could negatively affect the economics of the livestock operations, potentially to the point where permittees would no longer have a viable operation; and that the Forest Service is not adequately funded to administer the permits. Also, there is a risk on the Sheridan Lake, Deerfield, Old Hill City Highway, and Twin Spring roads for livestock-vehicle collisions because the cattle are not fenced off of the road right-of-way. This is especially a concern along the Sheridan Lake Road which is scheduled to be reconstructed and straightened out, thereby resulting in higher speeds and traffic; and the Deerfield Road which would likely see increased traffic after the scheduled upgrade and paving of the South Rochford Road is completed.

The Proposed Action is designed to continue livestock grazing, subject to Forest Plan direction and desired resource conditions, and to fence off the rights-of-way along the listed roads. The Proposed Action includes additional costs to the permittee, varying by allotment, for reconstruction of existing improvements and construction of new fences, water developments and cattle guards. These actions could affect the economics of the livestock operations. In addition, in order to meet Forest Plan standards and desired resource conditions in stream/riparian and upland areas, actual use on some allotments might be less than currently allowed. The Forest Service would see additional costs for long-term monitoring on stream/riparian and upland areas.

Measurement Indicators for Social/Economic:
- Risk of livestock-vehicle collisions
- Potential for actual grazing use reductions
- Cost to Permittees
- Cost to Forest Service

CHAPTER 2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

INTRODUCTION

This chapter provides a detailed description of the proposed action (Alternative C), another action alternative to the proposed action (Alternative B), as well as No Action alternative (Alternative A) for the Mystic Range Project. Maps of the proposed action and alternatives are located in Appendix F of this EIS.

This chapter presents the alternatives comparatively by both describing and displaying the quantitative and qualitative differences between each alternative. The intent is to provide the public and decision maker a basis for choice among management options when considering the environment consequences (effects) of implementing each alternative as disclosed in Chapter 3 of this EIS.

A brief overview is presented toward the end of this chapter regarding those alternatives that were considered by the Core ID Team but eliminated from detailed development and study. The last section of the chapter contains a comparative table that summarizes each alternative and displays the quantitative and/or qualitative effects of implementing each alternative relative to the issues presented in Chapter 1.

ALTERNATIVES CONSIDERED IN DETAIL

The Forest Service analyzed three alternatives, Alternative A the No Action, Alternative B, and Alternative C the Proposed Action.

ALTERNATIVE A – NO ACTION

Alternative A (No Action) – Alternative A is the no action alternative. Under this alternative, grazing would not be reauthorized and the current permit holders would be notified that their term grazing permits would be cancelled. All term grazing permits would be cancelled after two years, pursuant to Forest Service Handbook (FSH) 2209.13 part 16.24, and Code of Federal Regulation (CFR) 36 CFR 222.4(4)(1). The FSH and CFR regulations indicate that a two-year notification is required prior to cancelling a permit, except in emergency situations.

The no action alternative would close eight allotments, eliminating livestock grazing from 85,055 acres of National Forest System lands. Permits would not be issued for any of the eight affected allotments unless a subsequent NEPA analysis and decision to restock the allotments was made.

Maintenance of range developments on the allotments would no longer be the responsibility of the permittees. Developments built to facilitate livestock management, including allotment and pasture fences, livestock enclosures, and stock water ponds and water developments would be abandoned. Permittees who participated in the development of range improvements would be reimbursed for their amortized share, consistent with direction in FSH 2209.13, Chapter 70. Developments built that would benefit wildlife or reduce wildlife effects to resources, such as water developments and

big game enclosures would remain in place and would continue to be maintained by the Forest Service and/or cooperators. Maintenance of unassigned allotment boundary fences would be assigned to the adjacent permittee, if one is present.

The following structural improvements would be abandoned:

- Approximately 145 miles of fence.
- Approximately 219 water developments.
- Approximately nine miles of pipeline

Spring boxes and underground pipes associated with water developments would be abandoned; pipes would be disconnected. If left in place, pipes would be capped on one or both ends to prevent water from flowing through the pipes. Unused fences would be removed as funds permit or as opportunities become available to utilize human resource labor programs such as the Youth Conservation Corp or other similar programs. All salvage materials would be stored for re-use, disposed of in a landfill, or recycled.

ACTIONS COMMON TO BOTH ACTION ALTERNATIVES

Both Alternatives B and C are designed to improve resource conditions in rangeland health, vegetation, watershed conditions, designated Botanical Areas, and wildlife habitat relative to livestock grazing. Both respond, to varying degrees, to the purpose and need for this project and the issues presented in Chapter 1 of this EIS.

Both alternatives would reauthorize grazing on all eight allotments. Changes would be made to some of the allotments. Structural range improvements would continue to be maintained annually, and reconstructed, as needed. The permittee would be responsible for maintenance and reconstruction. The Forest Service would assist in funding material costs for reconstruction, as funding allows. Both alternatives include maintenance and reconstruction if some existing improvements and removal of others that are no longer needed. Reconstruction should generally be completed within the next 3-5 years. Removal of improvements that are no longer needed should be accomplished within the next 5-10 years.

Individual Allotment Management Plans (AMP's) would be assembled from the EIS record of decision summarizing directions for goals and objectives, approximate season of livestock use, kind and class of livestock, stocking guidelines (approximate AUM's), applicable Forest Plan Standards and Guidelines, anticipated rotation of livestock, planned range structural improvements including probable adaptive improvements (if exceeded), and monitoring requirements.

Residual levels (or remaining height of key plant species) would be prescribed for riparian areas in Annual Operating Instructions. Initially this would be 4" for key specie(s) (University of Idaho, 2004). Proper allowable use by percent weight is 50% for uplands. Livestock would be moved to the next pasture before thresholds for upland and riparian triggers are reached, based on adherence to Forest Plan Standard 2505. Permittees are responsible for monitoring these conditions.

Alternatives B and C also have a long-term effectiveness monitoring plan to assess upland and riparian conditions and trends (see Chapter 2 Monitoring). The Forest Service is responsible for this

effectiveness monitoring. If monitoring does not indicate progress towards desired conditions, it may be necessary to change proper allowable use percent utilization by weight from 50% to 45%, and/or increase residual riparian stubble height to six inches, and/or implement other adaptive option(s).

The actual number of livestock and season of use would be determined each year prior to grazing and would be outlined in the Annual Operating Instructions (AOI). Factors such as drought, fire, or other specific management objectives could all influence annual livestock numbers and season of use. These variables are considered during winter meetings with each permittee to determine the upcoming grazing season's permitted use. The degree to which drought impairs the range's potential for future forage production depends on the intensity, frequency, and timing of grazing. Design criteria include development of a drought management strategy.

Both alternatives include adaptive management options that could be implemented if needed to meet desired resource conditions. Adaptive management options are presented in Table 2-1. The main difference between the two alternatives is that Alternative C includes new structural improvements and prescribed burning, while Alternative B does not (USDA, Forest Service, Quimby, 2006, 2007).

ALTERNATIVE B

COMMON TO ALL ALLOTMENTS

Alternative B is designed to maintain or improve resource conditions without construction of any new structural improvements such as fences, cattleguards, and water developments. Existing improvements would be maintained or reconstructed, as needed. Structural improvements that need to be maintained or reconstructed are presented by allotment in Appendix F.

Some tools for effecting change in condition and trend are adjusting the timing and duration of livestock use, and moving to the next pasture before allowable proper use by weight guidelines and/or riparian stubble height requirements are exceeded. The permittee's primary methods may be: 1) strategic salt and/or supplement placement, 2) range riding to influence animal behavior by working the livestock, and 3) culling animals that do not range out from riparian areas. The purpose of using these methods is to achieve grazing efficiency, and reduce adverse effects on soils, riparian areas, and upland vegetation within the allotments that have specific areas that are not meeting desired conditions.

Bald Horse Allotment
The 27,828 acre Bald Horse Allotment is grazed using a nine pasture deferred rotation system from 06/01 to 10/26 each year, currently using 299 mature cattle (cow/calf pair) and approximately 1,921 AUMs. Existing structural improvements include 20 spring developments, three ponds, 14 water tanks, and approximately 37 miles of fence.

Alternative B would continue the existing nine pasture deferred rotation system on the Bald Horse Allotment. This alternative would continue the practice of non-use (no grazing) within the Buzzards Roost Pasture. Limited grazing could be allowed in the future if it is determined that such grazing would benefit other resource objectives. This alternative varies the order of pasture use each season. It reduces the number of days in the Middle Horse Pasture in order to improve riparian conditions. It

would temporarily increase the number of days in the Prairie Creek Pasture to help offset this reduction. No use would be allowed before June 15 in the Prairie Creek Pasture to avoid conflicts with bighorn sheep lambing use.

Some existing improvements would be reconstructed to ensure their effectiveness and others that are no longer needed would be removed. This includes reconstructing the spring exclosure and repairing a pipeline to the water tank at Van Pelt Spring in the Lower Victoria Pasture, reconstructing or relocating the water development in the north half of the West Horse Pasture, improving drainage around the existing water tank (south of Twin Sisters) increasing exclosure protection in the South Bald Hills Pasture, and reconstructing and enlarging the spring exclosure on the northwest end of the Middle Bald Hills Pasture. To prevent cattle from straying into Pactola Basin, Alternative B removes an unused cattleguard from FSR 164 and uses the materials to install a cattleguard in FSR 165 to replace the existing steel gate; and repairs fencing along the Centennial Trail, as needed, in the Prairie Creek Pasture. Alternative B also would remove any interior fencing in the Buzzard's Roost Pasture, and remove a defunct water development on southwest corner of the Prairie Pasture.

Deerfield Allotment

The 7,874 acre Deerfield Allotment is grazed using a six pasture system from 06/06 to 10/25 each year, currently using 102 mature cattle (cow/calf pair) and approximately 628 AUMs. Existing structural improvements include nine ponds and approximately 26 miles of fence.

Alternative B would continue the current six pasture grazing system, and maintain existing structural improvements. It recommends continued use of a range rider in the Heely Pasture. It would reconstruct the pond at the FSR 691.1J/691.1G junction for an improved watering source in the Gold Run Pasture. No improvements need removal at this time. As with the current practice, Alternative B would maintain the protective boundary and not allow grazing within the McIntosh Pasture. Some limited grazing could be conducted within the McIntosh Pasture if it is determined to be beneficial for weed control or other botanical purposes. This would require development of a separate management plan.

Palmer Gulch Allotment

The current 14,190 acre Palmer Gulch Allotment has two permittees and is split into two separate grazing rotations: five pastures on the north half and six pastures on the south half. The north half is 4,843 acres in size and utilizes a five pasture deferred rotation system. The permitted use on the north half is from 06/01 to 10/10 currently using 74 cow/calf pair and approximately 424 AUMs. The south half is about 9,327 acres in size and utilizes a six pasture deferred rotation system. The permitted use is from 06/01 to 10/21 currently using 67 cow/calf pair and approximately 416 AUMs. It includes a small (20 acre) on/off winter use pasture (Summit) adjacent to private land. Existing structural improvements include three spring developments, 18 ponds, one water tank, and approximately 27 miles of fence for both halves of the allotment.

Alternative B would continue the split between north and south for this allotment, and would formalize the split by dividing it into two separate allotments. For this evaluation, reference will be made to the "North Half Palmer Gulch" and the "South Half Palmer Gulch."

North Half Palmer Gulch Allotment
Alternative B would operate on three pastures instead of five currently permitted because two of the pastures – Sawmill and Dump – are currently unusable. The Sawmill Pasture is currently not grazed due to lack of private land fencing. The Dump Pasture has not been grazed since 2003 because there are no railroad cattleguards in place to control cattle access onto the railroad right-of-way. In total, non-use in these two pastures would result in a total of 44 days reduction in actual grazing use.

Alternative B includes reconstruction of the Joe Dollar Mine water tank and spring development in the Samalias Pasture. This alternative would also remove approximately one half mile of unneeded ROW fence in the Keystone Pasture and one third mile of unused fence on the Sawmill Pasture. Alternative B would also maintain two ponds in the north half of the Ford Pasture and three ponds in the south half of the Samalias Pasture.

South Half Palmer Gulch Allotment
Existing pastures would continue to be used on the South Half Palmer Gulch Allotment. The permitted use is from 06/01 to 10/21 currently using 67 cow/calf pair and approximately 416 AUMs, including the grazing of three cow/calf pair of occasional winter use on a 20 acre pasture from 10/22 to 5/31 for approximately 29 AUMs.

A cooperative effort may be made with the Hell Canyon RD and the permittee in the design and implementation of an aspen regeneration project (Norbeck FEIS) to ensure livestock trailing to adjacent pastures is possible after project completion. No use would be allowed in the Palmer and Sunday Pastures before June 15 to avoid conflicts with bighorn sheep lambing use. Livestock would be removed from these pastures around August 1 to allow grass/forb regrowth for winter use by wildlife. Alternative B would remove the unused FS horse pasture fence in the East Zimmer Pasture and allow livestock grazing, and relocate the temporary water tank, when used, on the Lower Bear Pasture.

Porcupine Allotment
The Porcupine Allotment currently uses a Holistic Management (HM) team approach, which has been in effect since 1988. The allotment totals 9,858 acres and utilizes 12 pastures by planned grazing from 06/09 to 09/30 and averages 334 cattle (cow/calf with some yearlings) and an average 1,652 AUMs. Variable numbers and season allowed each year for this HM allotment. Existing structural improvements include three vertical wells, five spring developments, 19 ponds, eight water tanks, nine miles of pipeline, and approximately 34 miles of fence

Alternative B would continue the existing HM grazing system and permitted average AUMs.

It also proposes to bury all existing exposed pipelines for protection from wildfire, equipment, and sunlight damage; reconstruct exclosure of North Antelope Springs, and may rest one pasture per year over a twelve year cycle unless specific reasons indicate grazing treatment is necessary. Grazing would generally be conducted early or late season in the Signal and South Exchange Pastures to favor consumption of noxious weeds.

Redfern Allotment
The 11,573 acres Redfern Allotment utilizes a five pasture deferred rotation system from 06/11 to 10/25, currently using 195 cow/calf pairs at approximately 1,159 AUMs. Existing structural

improvements include six spring developments, 26 ponds, three water tanks, and approximately 18 miles of fence.

The total permitted use under Alternative B would be 177 cow/calf pairs, based on a reduction of 18 pair from the existing permit because of a pending term grazing permit waiver. This alternative would maintain the existing structural improvements. It would also relocate or reconstruct two water sources in the west central, upland portion of the Slate Creek Pasture, remove a defunct water development located approximately 0.75 miles east of Queen Bee Mine property on the Queen Bee Pasture, and determine if the horse pasture is necessary and resolve maintenance issues, also on the Queen Bee Pasture.

Rimmer Allotment
The Rimmer Allotment includes 2,011 acres split between two pastures operating from 06/11 to 10/10, currently using 33 cow/calf pairs and approximately 175 AUM's. Existing structural improvements include one spring development, two ponds, and approximately five miles of fence.

Alternative B would modify the allotment by incorporating the underutilized West School Pasture from the Slate Prairie Allotment into the Rimmer Allotment to form a third pasture. The number of days would be reduced to lessen the duration of use in the Rimmer Pasture. Initially, the Rimmer Pasture use would be reduced by 10 days and the Grandad Pasture reduced by four days. These reductions would be made up by the added West School Pasture. The allotment would increase in size by approximately 77 acres with the addition of the West School Pasture.

Alternative B would reconstruct the exclosure at Lost Park Springs and repair two gates along the Deerfield Trail 40.

Slate Prairie Allotment
The existing 5,896 acre allotment is managed using a five pasture deferred rotation system from 06/01 to 10/20 currently using 200 mature cattle (cow/calf) at approximately 1,232 AUMs. Existing structural improvements include 23 ponds, three water tanks, and approximately 13 miles of fence.

Alternative B would modify current management by removing the West Slate School Pasture and adding it onto the existing Rimmer Allotment, since it is underutilized by Slate Prairie permitted livestock, and always grazed late in season. Use with the Rimmer Allotment (same permittee) would allow for variation in season of use. This change would reduce the Slate Prairie Allotment by 77 acres and two days of use. Alternative B would maintain existing structural improvements, except as noted below where reconstruction or removal would be required.

Reconstruction or removal of existing improvements include the following: reconstruct fence to protect spring from trampling in the north end of the Mystic Pasture; reconstruct spring exclosure in lower Daugherty Gulch, rebuild approximately 0.20 miles of drift fence in Crooked Creek at the junction with Castle Creek, and remove a remnant exclosure in the drainage east of Crooked Creek draw that is overgrown with brush and trees - all on the Whitetail Pasture; and use rock to reinforce the pond spillway on the Slate School Pasture.

Tigerville Allotment
The existing 5,825 acre allotment is managed using a six pasture deferred rotation system from 06/01 to 10/25 currently using 112 cow/calf at approximately 715 AUMs. Existing structural improvements include: four spring developments, 19 ponds, and approximately 19 miles of fence.

Alternative B would combine two pastures (Westside and Lena) and incorporate an 80 acre portion a portion isolated from the adjacent allotment.

Under Alternative B, the Lena and West Side Pastures would be combined and the common fence separating the two pastures would be removed. The fence is no longer functional and not needed for proper management. An existing spring exclosure fence would be reconstructed and enlarged in the northeast corner of the Tigerville Pasture. A portion of the Newton Fork Allotment east of Deerfield Road would be incorporated into the existing Mini Pasture. The Mini Pasture would be grazed once a year with either the Tigerville or Redfern Pasture for approximately 20 days per year or less. An existing water point access to Slate Creek in the Deer Park Pasture would be armored with gravel and rock. The old corral in the Marshall Pasture would be rebuilt into a small holding corral for removal of strays or injured livestock. Old corral materials would be removed.

ALTERNATIVE C

COMMON TO ALL ALLOTMENTS

Alternative C is designed to maintain or improve resource conditions using a full suite of options, including construction of new structural improvements such as fences, cattleguards and water developments. Existing improvements would be maintained or reconstructed, as needed. New "core" structures - those required under Alternative C - are intended to provide better resource protection, get better livestock distribution, and reduce the potential for livestock-vehicle collisions along higher speed roads. It also includes adaptive options to construct improvements if determined necessary after other measures are implemented. These adaptive improvements might not ever be constructed, but are considered here to provide flexibility in case they are needed. As with Alternative B, reconstruction activities are generally expected to occur within a 3-5 year timeframe. New structural improvements are generally expected to occur in 1-3 years. Adaptive improvements are more likely to be constructed in 5-10 years, if at all. Many or most may never be constructed. New and adaptive structural improvements, and those that need to be maintained or reconstructed, are presented by allotment in Appendix F (USDA, Forest Service, Quimby, 2006, 2007).

Some tools for effecting change in condition and trend include the construction of new structural improvements to restrict and distribute livestock use, adjusting the timing and duration of livestock use, and moving to the next pasture before allowable proper use by weight guidelines and/or riparian stubble height requirements are exceeded. The permittee's primary methods may be: 1) strategic salt and/or supplement placement, 2) range riding to influence animal behavior by working the livestock, and 3) culling animals that do not range out from riparian areas. The purpose of using these methods is to achieve grazing efficiency, and reduce adverse effects on soils, riparian areas, and upland vegetation within the allotments that have specific areas that are not meeting desired conditions.

Bald Horse Allotment
Alternative C incorporates all the provisions of Alternative B. It also includes new structural improvements to improve riparian and other resource conditions, better livestock distribution, and removing livestock access from high speed roads. In total, this alternative proposes construction of approximately three miles of fence and four water developments.

New structural improvements include constructing a small corral for stray round-up in the southeastern portion of the Lower Victoria Pasture, fencing off a pond and piping water to a tank in south half of the West Horse Pasture, and developing an alternative water source in the northwest portion of the Middle Victoria drainage to better distribute livestock. It would also require constructing approximately 2.5 miles of fence to restrict cattle from the Sheridan Lake Road ROW, Spring Creek and associated riparian area, and trailhead. A water source would be developed within the draw along Burnt Ranch Pasture to replace loss of access to Spring Creek.

Alternative C also includes some adaptive options for structural improvements if resource conditions warrant their construction. This includes developing additional sources of water to better distribute livestock in the east side of the Middle Horse, North Bald Hills, and in the Lower Victoria Pastures. The spring source along FSR 677 at the common boundary with Redfern Allotment might also be developed for joint use. Other adaptive actions might be to reconstruct on a different alignment with the west boundary of the West Horse Pasture. Also, the spring on the north side of the Middle Bald Hills Pasture against private property might require further protection.

Deerfield Allotment

Alternative C includes the provisions contained in Alternative B, and also would eliminate use in the Lake Shore Pasture, thereby becoming a five pasture deferred rotation system. This would reduce actual use by six days on the allotment. Additional fencing would be constructed off the existing Gold Run boundary fence to one new cattleguard on the Ditch Creek Road (both on the north end of the pasture) to prevent livestock access to highway. Additional fencing would be constructed along the ridgeline between the Trap Pasture and Baseline Pasture boundary. An adaptive option that might be employed is constructing over four miles of fence to protect the Heely Creek riparian area, but is not likely to occur as the initial cost is very high.

Palmer Gulch Allotment

Alternative C would continue the split of this allotment between north and south, and would formalize the separation by dividing it into two distinct allotments (north half would become Oblivion, south half would be Palmer Gulch). Maintenance, reconstruction, and removal of existing improvements would occur as presented in Alternative B. New structural improvements would be required under this alternative, and adaptive structures are included that might or might not be constructed in the future depending on need. There are also changes in some use and pastures as compared to Alternative B. Alternative C includes an adaptive option for constructing fences or otherwise excluding livestock use within the Norbeck Wildlife Preserve, if needed, to provide for game animals and birds.

North Half Palmer Gulch Allotment

Alternative C would operate on four pastures instead of the currently permitted five. The Sawmill Pasture is currently not grazed due to lack of private land line fencing. It would be used only for trailing livestock west of Pink Cabin Road and east of the Dump Pasture. The Dump Pasture, currently in non-use status, would be authorized for use after the permittee works with the 1880 Train to install cattleguards to prevent cattle access along the train ROW (Alternative B does not authorize the cattleguards). Alternative C would operate on a four pasture deferred rotation system utilizing the existing Keystone, Ford, Dump, and Samalias Pastures. Non use of the Sawmill Pasture would result in a reduction equivalent to 20 days of use on the allotment.

New structural improvements to be constructed on the Keystone Pasture include fencing off livestock access to Old Hill City Highway and Palmer Creek with approximately one mile of fencing north of railroad ROW and installing one new cattleguard on Twin Springs Road, and building a water development in the southern end of the pasture. A ditch would be re-contoured and reseeded near the Battle Creek drainage on the Ford Pasture. Alternative C contains an adaptive option for constructing approximately one mile of fence to exclude livestock use in the Norbeck Wildlife Preserve in the Ford Pasture. On the Samalias Pasture, livestock access would be fenced off to protect willows and a spring source located west of Samalias Trailhead, while providing a water access point for livestock; and an exclosure would be constructed around willows and a spring source located north of Rustic Ridge Guest Cabins. Approximately one half mile of fence would be built to prevent livestock use to Spring Creek in two locations.

South Half Palmer Gulch Allotment

Existing pastures would continue to be used on the South Half Palmer Gulch Allotment, except for the occasional winter use adjacent to private land on the Summit Pasture. Structural improvements would be made within the Norbeck Wildlife Preserve to improve conditions for game animals and birds. Otherwise, provisions for Alternative C would be similar to those of Alternative B. This includes the provision that no use would be allowed in the Palmer and Sunday Pastures before June 15 to avoid conflicts with bighorn sheep lambing use; and livestock would be removed from these pastures around August 1 to allow grass/forb regrowth for winter use by wildlife.

Grazing would be eliminated on the 20 acre incidental use on-off winter use Summit Pasture. Approximately one half mile private landline fence would be constructed to accommodate this change. The Summit Pasture would be combined into the Rabbit Pasture after the fence is constructed. A livestock exclosure would be constructed around the Fender Place pond and spring to meet Norbeck goals and objectives on the Rabbit Pasture; and an exclosure fence would be constructed around the spring in the north end of the East Zimmer Pasture. The Forest Service would install steel plates to raise the water table to reduce erosion and fill incisions in the Palmer Pasture.

Adaptive options that might be pursued, if needed, would be to provide off-site temporary water tanks in drought years on the Rabbit Pasture, and fencing off riparian access to livestock if moving a temporary water tank in the Lower Bear Pasture is not effective in reducing impacts. For both the Lower and Upper Bear Pastures, an adaptive approach might be to increase pasture size to spread out grazing use by constructing approximately two miles of new fence on the east end of pastures. This would also re-locate one cattleguard and install a new cattleguard on each of these pastures. Alternative C contains the provision for constructing fence or otherwise excluding use within the Norbeck Wildlife Preserve, if needed, to provide for game animals and birds. This fencing could be approximately three miles in length and would reduce grazing on the Rabbit, Sunday, and Palmer Pastures.

Porcupine Allotment

This alternative would continue with the HM planned grazing as proposed in Alternative B. It would also require construction of new structural improvements and provide the option to construct additional improvements if needed for resource management purposes. Required improvements include construction of a fence to exclude livestock from Wells Spring in the Wells

Cabin Pasture, construction of a fence to exclude livestock from The Seeps in the South Wolf 1 Pasture, and construction of approximately 1.75 miles of pasture boundary fence to better control livestock and regulate animal impact in the Babbington-South Wolf 1 Pasture. It also includes installation of new water storage and water tanks in the northeast side of the Wildcat-North 1 Pasture. Approximately 0.75 miles of new pipeline would be extended from the Babbington Pasture to the new water development.

Alternative C includes a number of adaptive options to construct additional improvements, if needed, in keeping with Holistic Management objectives. This includes constructing approximately 1.7 miles of cross-fence to split the Antelope Springs Pasture in half on an east/west axis, along with a cattleguard on FSR 283; and constructing approximately one mile of cross-fence to split the South Wolf 1 Pasture in half on an north/south axis, along with a cattleguard on FSR 284. Adaptive options for the Wildcat-North Pasture consists of 0.60 mile of temporary fence in the middle of the pasture to exclude livestock from the Wildcat Quarry, if it is developed; and increasing watering locations in the Signal Pasture by constructing 1.7 miles of new pipeline to two new water storage tanks, and add two new water tanks on the north and east sides of the pasture. Additional watering locations might also be desirable in South Exchange Pasture and would include constructing approximately one mile of new pipeline to a new water tank on the north side of the pasture. If the permittee's negotiated access to facilities on Cooper Ranch (State property) were terminated by land owner, an option would be to locate and construct a small corral for loading and unloading livestock on NFS lands on the South Exchange Pasture. Some temporary fencing might be used to confine livestock on the Yount Pasture and an option exists to add approximately 1.2 miles of new pipeline on the West Hells Canyon 1 Pasture.

Approximately 5,300 acres of prescribed broadcast burning is proposed under this allotment to reduce fuel loading buildup from dead and down pine trees and improve forage and browse.

Redfern Allotment

This alternative also displays the anticipated change in the number of cow/calf pairs from 195 to 177, as included in Alternative B. It also would maintain existing improvements and reconstruct or remove structural improvements as presented in Alternative B. In addition, Alternative C would require construction of some range improvements, and combine the Redfern Holding Pasture with a newly fenced off portion of the Slate Creek Pasture. Specifically, Alternative C requires fencing off approximately one mile of Slate Creek along FSR 530 to Slate Creek Dam by building approximately 1.5 miles of new fence, and installing one cattleguard in FSR 530.1c where the fence crosses the road. The riparian acreage fenced off from the longer duration Slate Creek Pasture would be incorporated into the shorter duration Redfern Holding Pasture. Grazing would increase by two days in the Redfern Holding Pasture after the fence is constructed.

Rimmer Allotment

This alternative would incorporate the changes in pastures and slight increase in size for the Rimmer Allotment as proposed in Alternative B. It would also continue maintaining the existing improvements on the allotment. Refer to Alternative B description.

Alternative C includes some adaptive options and additional construction if needed to meet desired resource conditions or other purposes. Some of these options are made possible because the current permittee also runs on the adjacent Slate Prairie Allotment. Possible new construction

includes extending existing fencing or connecting segments up to 1.75 miles long if livestock stray off the north and east boundaries of the Rimmer Pasture. Another option would be to increase the size of the West School Pasture by adding the west third of Slate School Pasture (estimated 120 acres) from the Slate Prairie Allotment into the Rimmer Allotment. This would require installation of one cattleguard on NFSR 188 to control livestock. It also could be managed as a separate pasture within the Rimmer Allotment, and called the "188" Pasture. An existing, non-functional water development in the northeast corner of the pasture would need to be reconstructed. Another adaptive option may be to create a fourth additional pasture called the "187" Pasture. While the probability of implementing this option is low because of cost, it might be considered. It would require the installation of one cattleguard and approximately 0.60 miles of new fence at T1N R3E S15 NWSESE. This action would split off an estimated 500 acres from the Rimmer Pasture. Additionally, access to a possible water source in the southeastern corner of the Rimmer Pasture would need to be reconstructed.

Slate Prairie Allotment
This alternative would incorporate the changes in pastures and slight reduction in size for the Slate Prairie Allotment as proposed in Alternative B. It would also complete the same reconstruction of needed improvements and removal of unneeded improvements. Refer to Alternative B description.

In addition, Alternative C includes some adaptive options for additional construction, if needed. This includes development of the Browner Spring with the Bittersweet Allotment permittee (located on the west side of this pasture) and constructing up to 0.5 miles of drift fencing on the north boundary of this pasture to keep livestock within assigned area in the Whitetail Pasture. Another option is to expand protection of Daugherty Gulch's existing spring exclosure in the Hay Draw Pasture to improve the distribution of age classes of willows in this drainage. Another option would be to fence off a pond to livestock access, and pipe water to downstream stock water tank in the Slate School Pasture.

Tigerville Allotment
This alternative would incorporate the changes in pastures and slight expansion in size proposed by Alternative B, and would complete the same reconstruction of needed improvements and removal of unneeded improvements. Refer to Alternative B description.

In addition, Alternative C includes some adaptive options for additional construction, if needed, to meet desired resource conditions or other purposes. This includes construction of protective fencing around breeched beaver dams and willow remnants in the southeast corner of the West Side Pasture. Also possible is construction of up to one third of a mile of highway ROW fencing off the southwest corner of the Mini Pasture. This fence would add approximately 80 acres to the pasture. An adaptive option for construction of a small corral may need to be exercised if use of a private, off NFS lands corral is no longer allowed in the Redfern Pasture. An exclosure may need to be constructed around a fen area located north of Gooseberry Trailer Park in the Deer Park Pasture.

ADAPTIVE MANAGEMENT OPTIONS

Both Alternative B and C exercise "adaptive management" as warranted by monitoring results. Adaptive management is defined as a process where land managers implement management practices that are designed to meet LRMP standards and guidelines, and would likely achieve the desired conditions in a timely manner. If monitoring shows that desired conditions, as described by LRMP

Direction, are not being met, then an alternate set of management actions, the effects of which are analyzed in this EIS, may be implemented to achieve the desired results. Management practices that are possible options are shown in Table 2-1 (USDA, Forest Service, Quimby, 2006, 2007)(Vallentine, 1989)(Savory, 1999).

Table 2-1 Adaptive Options

Common to Alternatives B and C
Change percentage allowable use and/or residual riparian stubble heights.
Increase or decrease stocking rate to vary grazing impacts.
Vary timing and duration of use based on riparian conditions.
Use salt or supplement to draw livestock toward or away from specific areas.
Incorporate a range rider to move livestock (herding).
Change season of use.
Change animal numbers.
Change animal class.
Change days of use per pasture.
Change number of pastures per allotment.
Split, combine, or change boundaries of allotments and/or pastures.
Adjust permitted AUMs.
Adjust livestock turn-out date.
Adjust livestock end of season date.
Designate Forage Reserve allotments.
Rest pasture and/or allotment from livestock grazing for one or more seasons.
Do not allow livestock grazing.
Control and distribute livestock using water.
Reconstruct livestock water development (i.e. springs, pipelines, tanks, windmill, sediment traps, wells, stock dams, submersible pumps, solar).
Utilize brush barriers to control livestock distribution.
Remove existing water development.
Remove existing fence line.
Implement a high-intensity/short duration grazing system.
Implement deferred or rest-rotation grazing system.
Restore or enhance native grass, forb, and shrub species.
Brush and clean cattle trails and fences to improve livestock access and distribution.
Change animal behavior.
Utilize temporary grazing permits to meet specific resource needs (fuels reduction, thistle control, reduce density of smooth brome, etc).
Reduce undesirable plant species by mechanical, chemical, and biological means (i.e. fringed sage, snowberry, smooth brome, cheatgrass, thistle, etc).
Common to Alternative C
Construct fence to create riparian pasture.
Construct fence to exclude livestock.
Construct fence to control livestock distribution (temporary, permanent, electric, etc.).
Construct livestock water development (i.e. springs, pipelines, tanks, windmill, sediment traps, wells, stock dams, submersible pumps, solar).
Use prescribed fire to improve resource conditions.
Utilize Holistic Management.

DESIGN CRITERIA

Design criteria include standard practices such as Forest Plan Standards and Guidelines, Best Management Practices, and others. They are actions that are applicable and expected to be implemented as a matter of standard operating procedures consistent with the theme of a given alternative. Design criteria are applied in order to protect resources and forest users, as well as minimize impacts resulting from implementing action alternatives (See Appendix B).

MONITORING

Monitoring and evaluation are key elements of adaptive management. Monitoring helps determine how LRMP and NEPA decisions are being implemented, whether implementation is achieving the desired outcome, or whether changes in management are needed. Through monitoring, the Forest Service can measure whether or not desired conditions are being achieved in an appropriate timeframe. Through adaptive management, allotment management plans can remain dynamic, relevant, and useful documents over many years.

Two types of monitoring are associated with allotment management plans: implementation monitoring and effectiveness monitoring. Implementation monitoring (short-term) measure whether or not Forest Plan standards and guidelines are being met, while effectiveness monitoring (long-term) evaluate how effective management actions are at moving toward or achieving the desired conditions.

Budgets, personnel, and resource condition would determine the scope and degree of rangeland monitoring activities. A realistic implementation monitoring strategy would be to monitor all of the allotments using both Forest Service and permittee monitoring. Much of the implementation monitoring is actually the responsibility of the permittee. However, Forest Service range managers and other specialists, such as botanists, wildlife biologists, and archeologists, also monitor compliance with FP standards and guidelines. Upland and riparian monitoring areas would be the focus of effectiveness monitoring which is primarily the responsibility of Forest Service personnel. However, range permittees are always welcome to participate in effectiveness monitoring.

Rangeland Implementation (Short-term) Monitoring

Short-term range monitoring techniques would vary depending on the resources being monitored. Monitoring would take place annually at key areas of livestock use on each allotment. Key areas are selected to monitor the effects of management activities on ecosystem health. These key areas are selected as monitoring points in a pasture or grazing unit because of its specific location, use, and/or grazing value. Examples of key areas may include, but are not limited to, uplands, riparian areas, and valley bottoms. All agency monitoring methods can be used in monitoring efforts. The following monitoring techniques would generally be used alone or in combination:

- Range Readiness: Indicators used to determine rangeland readiness are soils and vegetation conditions. Rangelands are generally ready for grazing when soils have become firm after winter and spring precipitation, and when plants have reached the

defined stage of growth at which grazing many begin under the specific management plan without long-lasting damage.

- Ocular Utilization Estimate: Ocular estimates provide a visual estimate of utilization of riparian and upland herbaceous or browse species. Estimates are based on a description representing a broad range (class) of utilization rather than a precise amount (U.S. Forest Service 1996b).
- Stubble Height: Adequate stubble height on streamside areas is needed at the end of the grazing period or at the end of the grazing season, for maintenance of plant vigor and stream bank protection and to aid in holding sediments for rebuilding degraded stream banks. Measurements of the residual amount of *Carex* spp. are taken along the greenline. Specifically, 3-4 inches of residual *Carex* spp. are required for spring pastures and 4-6 inches for summer and fall pastures (U.S. Forest Service 1996b).
- Photographs and Photo-points: Photographs are extremely useful in documenting change on the landscape. Photos should capture the essence of the plot, point or transect, including important characteristics and features of the site. Photos need to include enough of the horizon-line to allow the photographer to easily repeat the photograph from the same angle at a different time.

Rangeland Effectiveness (Long-term) Monitoring

Probably the most important role of monitoring is to determine whether management is successful at maintaining or moving rangeland resources towards desired conditions. Determining trend toward or away from allotment objectives allows rangeland managers to accurately determine the relative success of the management system and to adjust management to speed the accomplishment of objectives. Trend for a variety of rangeland resource parameters may need to be monitored.

The long-term condition of riparian and upland grass and forb resources would be monitored at benchmark areas on each allotment. All agency monitoring methods can be used in monitoring efforts. The following monitoring techniques would generally be used, as needed:

- Cover-Frequency: The Cover-Frequency transect is commonly used to provide quantitative measurements of canopy cover and frequency by plant species, ground cover, and production by life form for inventory and monitoring purposes (U.S. Forest Service 1996b).
- Green Line/Cross Section: Green Line/Cross Section's are used to describe and quantify the distribution of riparian communities within the riparian area. A series of paced transects are established both perpendicular and parallel to the stream in order to measure the intercept of plant communities within the riparian area (U.S. Forest Service 1996b).
- Photographs and Photo-points: Photographs are extremely useful in documenting change on the landscape. Photos should capture the essence of the plot, point, or transect, including important characteristics and features of the site. Photos need to include enough of the horizon-line to allow the photographer to easily repeat the photograph from the same angle at a different time.
- Multiple Indicator Monitoring (MIM): This protocol combines observations of up to ten indicators (including greenline, streambank stability, livestock use on woody plants, woody species regeneration, stubble height, and streambank alteration) along the same transect. These indicators provide quantitative data to assess the current condition and

trend of the streambanks, channels, and vegetation, as well as provide data needed to refine and make annual changes to livestock management in order to meet long-term management objectives. (Burton et al. 2007). The current WCP Handbook (2006) does not provide any guidance on acceptable levels of stream bank alteration. An acceptable level of alteration that will maintain or promote stream bank stability is dependent upon many factors such as, stream type, water quantity, and riparian composition and condition. The ID Team chose $\leq$ 26% of streambank altered by hoof shear as the preliminary guideline for bank alteration. This trigger point has not been validated on the various stream types in the Black Hills, and may be adjusted over time to ensure that the long term desired condition of stream bank stability is achieved and maintained.

Tables 2-2 and 2-3 identify the specific short term and long-term monitoring plans for each allotment for Alternatives B and C.

Table 2-2 Alternatives B and C Implementation (short term) Monitoring common to all allotments (would take place annually):

Monitoring Site	Desired Conditions (also see Table 1-2)	Method	Frequency	Trigger Point	Change Needed
Key Upland Grazing Areas	<50% utilization by weight by livestock and wild herbivores of forage.	Ocular Utilization	Generally every one to three years; conduct periodically throughout the grazing season.	≥50% utilization	Relocate livestock from affected area or pasture. Adjust Annual Operating Instructions as necessary to achieve long term trend goals or maintain desired condition.
Key Riparian Grazing Areas	>4" plant stubble height (reference WCP handbook 3h) left after livestock and wild herbivore use.	Stubble height measurement or ocular estimate of selected specie(s).	Generally every year; conduct periodically throughout the grazing season.	≤4"stubble height	Relocate livestock from affected area or pasture. Adjust Annual Operating Instructions as necessary to achieve long term trend goals or maintain desired condition.
Key Upland and Riparian Areas - Utilization of woody species(FP standard 2505)	<40% of total individual leaders produced that year used by livestock and wild herbivores.	Ocular estimate of use of affected plant species.	Generally every one to three years; conduct periodically throughout the grazing season.	≥40% of total individual leaders used	Relocate livestock from affected area or pasture. Adjust Annual Operating Instructions as necessary to achieve long term trend goals or maintain desired condition.

Table 2-3 Alternatives B and C Effectiveness (long term) Monitoring specific to individual allotments (would take place every 5-10 years):

Bald Horse Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Lower Victoria #2	Maintain existing condition. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover Frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Middle Horse MIMS	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.

Bald Horse Allotment			
	plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.		
Middle Horse #4	Reduce bare ground. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Middle Victoria MIMS DMA #8	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.
South Bald Hills #2	Maintain existing condition. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.

*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species.
**Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).

Deerfield Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Gold Run #5	Reduce noxious weeds. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Heely Creek MIMS DMA #4	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and	MIMS with assessment of bare ground	Adjust Annual Operating Instructions and/or implement an adaptive management option.

Deerfield Allotment			
	maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%	percentage.**	
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species. **Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).			

Palmer Gulch Allotment (North Half)			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Keystone #2	Reduce noxious weeds. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of native plant species. OR >5% bare ground OR >2% noxious weeds and invasive species.			

Palmer Gulch Allotment (South Half)			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Rabbit #3	Reduce noxious weeds. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Bear Gulch MIMS DMA #6	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.

Palmer Gulch Allotment (South Half)			
	decadent ≤ 10%.		
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species. **Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).			

Porcupine Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Antelope #1	Reduce bare ground. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Babbington #2	Maintain existing condition. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Signal #3	Reduce noxious weeds. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Yount #2	Improve site productivity. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species.			

Redfern			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
White Earth #1	Reduce noxious weeds. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Slate Creek MIMS DMA #3	Restore stream channel so that year-round flows may occur. Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.

Redfern			
	and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%		
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species. **Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).			

Rimmer Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Rimmer #2	Reduce bare ground in overused areas. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Rimmer #3	Reduce bare ground in overused areas. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
CC1B MIMS DMA #5	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.
*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species. **Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).			

Slate Prairie Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Mystic #2	Reduce bare ground. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Whitetail #3	Historic Photo Point	Camera	Continuing need to document landscape changes over time.
Whitetail #4	Reduce bare ground. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Slate Creek MIMS DMA #9	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Whitetail/Crooked Creek MIMS DMA #2	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.

*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species.
**Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).

Tigerville Allotment			
Monitoring Site	**Desired Conditions (also see Table 1-2)**	**Method**	**Change Needed**
Lena #3	Maintain existing conditions. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Redfern #1	Reduce bare ground. Manage by providing for diversity of desirable plant species, <5% bare ground, < 2% noxious weeds.	Cover frequency*	Adjust Annual Operating Instructions and/or implement an adaptive management option.
Mini Pasture MIMS DMA #1	Increase riparian vegetation. Achieve and maintain diverse riparian plant community with stable streambanks (≥74% are rated stable); achieve and maintain <5% bare ground; <40% of current years willow leaders browsed; >80% plots contain hydric plant species. Well-distributed willow age classes reflected by seedlings and young of ≥25%, mature of ≥25%, and decadent ≤ 10%.	MIMS with assessment of bare ground percentage.**	Adjust Annual Operating Instructions and/or implement an adaptive management option.

*Frequency: Generally every four to eight years. Trigger Point for Cover Frequency: Declining trend in frequency of desired plant species. OR >5% bare ground OR >2% noxious weeds and invasive species.
**Frequency: Generally every three to six years. Trigger Point for MIMS: <74% streambank stability OR >5% bare ground OR ≥ 40% use of current year's willow leaders OR Declining trend in percentage of plots containing hydric plant species OR Declining trend in percentage of plots containing willows or skewed distribution of willow age classes (decadent dominant with lack of recruitment).

Other Resource Monitoring

The following methods would be used to ensure that livestock grazing is compatible with other resource objectives in accordance with Forest Plan direction and other laws:

- Heritage Site Monitoring: All National Register of Historic Places eligible sites would be monitored on a 1-5 year basis in accordance with the SHPO concurrence letters for livestock grazing to verify that management practices are being implemented.
- R2 Sensitive Plant and BHNF Plant SOLC Monitoring: Certain plant populations with known impacts or those adjacent to primary grazing areas would be monitored to determine level of impacts, if any, and recommended if adaptive management actions should be taken.

ALTERNATIVES CONSIDERED but ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of the proposed action, duplicative of the alternatives considered in detail, or could be incorporated into design and mitigation measures included in the proposed action. The following provides an overview of alternatives that were considered, but eliminated from detailed study.

Holistic Management on All Allotments - One commenter suggested an alternative incorporating Holistic Management (HM) for all of the allotments. The only allotment currently under Holistic Management is the Porcupine Allotment. Holistic Management is an intensive process that requires the permittee to embrace this approach for their entire livestock enterprise. Holistic Goals are defined for their enterprise, of which the permitted area on the National Forest is part of this scope. Such goals recognize Forest Plan Standards and Guidelines, and emphasize working with the ecosystem processes and effects of energy flow, mineral cycle, water cycle, and community dynamics in response to livestock grazing, and to move towards desired conditions (Savory, 1999). The Forest Service requires the development of a holistic team with members from the agency's specialists, the permittee, state game and fish department, university expertise, and environmental interests to guide goals, annual projects, and monitoring. The Forest Service cannot require permittees to utilize holistic management, but supports its use. Using HM is incorporated as an option under adaptive management (Table 2-1) for Alternative C. Therefore, requiring HM for all allotments was considered but eliminated from detail study.

Current Management – An alternative was considered that would essentially continue with the existing management of the subject allotments. This should not be confused with the approach presented in Alternative B of this EIS, which includes additional implementation and effectiveness monitoring practices. Current management was considered but eliminated from detailed study primarily because it does not provide for this enhanced level of monitoring to determine if management approaches are meeting or exceeding desired resource conditions.

Eliminate Livestock Grazing – Several responses suggested eliminating livestock grazing to solely support wildlife. This proposal is included in Alternative A, the No Action/No Grazing Alternative.

Immediate Reduction in Grazing by Area– A few responses recommended an immediate reduction in livestock use within core/key sensitive areas, or excluding livestock from steep canyon areas. Livestock are currently excluded from the McIntosh Fen; this would not change under any of the alternatives under consideration. The analysis did not find any serious issues with grazing in steep areas; capability assessments did not use forage production from slopes greater than 30%. Steep terrain naturally limits livestock use, although some steep canyon bottoms do receive livestock use. Alternative C was designed to restrict or reduce livestock use where needed for resource protection through additional fence construction, other structural improvements, or reduced days of grazing use. A separate alternative restricting livestock use was therefore not considered necessary to address the issues raised by these comments.

Immediate Reduction in Grazing by Numbers – Several responses suggested immediately reducing livestock numbers; one response recommended an immediate 30-50 percent reduction. These comments reflect a concern about poor resource conditions on some pastures and allotments. There are several reasons for these observed resource conditions. This includes too many livestock on an allotment, staying too long in a pasture, poor livestock distribution, not restricting use in sensitive areas, and weather conditions such as drought. Reductions in livestock numbers may well be required to meet desired resource conditions. Both Alternatives B and C are designed to ensure that allotments are not overstocked. Alternative B requires: 1) implementation monitoring to track that livestock are moved when or before utilization limits are exceeded, and 2) effectiveness monitoring to ensure that progress towards or maintenance of desired conditions is being verified. Alternative C uses these provisions and also includes additional measures (structural improvements and adaptive measures) to ensure that the allotments are not overstocked. By adhering to the required utilization standards, both Alternatives B and C could result in reduced livestock use immediately, and in the long term lower livestock numbers. Immediately reducing livestock numbers may not directly address the underlying reason for poor resource conditions, such as poor distribution. A separate alternative immediately reducing grazing numbers (cow/calf pairs) was considered but eliminated from detailed study because Alternatives B and C address the issue in a way that better determines the underlying reason for poor resource conditions in certain pastures and allotments. Both alternatives may lead to a reduction in cow/calf pairs, where appropriate. The process which re-evaluates grazing capacity, that is, the amount of livestock forage use that can be allowed while meeting basic resource needs and objectives is outlined in the Rocky Mountain Region's Rangeland Analysis and Management Training Guide (USDA Forest Service 1996a).

Immediate Reduction in Grazing by Timing – One response proposed reducing the time livestock are allowed on the range - not before June 15 or after September 1 of each year. Livestock use periods are typically determined by range readiness conditions and end of season utilization levels, using the grazing permit's stated period of use as a starting point for discussions each season. Season of use varies by allotment. For example, lower elevation range is ready earlier in the season than higher elevation range. Range readiness depends on several factors that can vary from year to year - temperature, moisture, soil conditions, and plant growth

stage. Range Readiness Guidelines already exist for these eight allotments. It is not reasonable to use one livestock turn-on date for all allotments and for all years. The typical season of use extends beyond September 1 for all of the allotments. Conditions are often warm at this time of year and conducive to livestock grazing. End-of-season livestock use is currently determined by range utilization and other factors. End-of-season can vary by year depending on specific range and other conditions. Both Alternative B and C address this concern by requiring that livestock are not let onto the range until proper range readiness conditions are met, and that livestock leave the range before utilization standards are exceeded. For these reasons, an alternative that sets arbitrary on-off dates was considered but eliminated from detailed study.

Establish Grass Banks – One response suggested a strategic look be taken to provide flexibility in the grazing program by establishing grass banks when the opportunity is presented. One way to do this would be to not issue new permits if and when existing permits are waived back to the Forest Service. This approach, known as "Forage Reserve Allotment" designation in the Forest Service Grazing Handbook, has been incorporated as an adaptive management option (shown in Table 2-1) for Alternative C. Once established, the reserved allotment or portions thereof may be used in conjunction with authorized livestock use when there is a loss of forage availability from a variety of factors. The displaced livestock may be temporarily or permanently assigned to the Forage Reserve allotment, depending on resource needs.

Develop a Drought Management Plan – A couple of comments recommended that a drought management plan be developed in order to deal with cyclical or long lasting climate changes. Development of a drought management approach or plan has been included in the Design Criteria for both Alternative B and Alternative C.

COMPARISON OF ALTERNATIVES

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. The environmental consequences of the alternatives to the resources affected in the Mystic Range Project Area are more completely described in Chapter 3 of this EIS and information contained in the Project File.

Table 2-4 Comparison of Alternatives

	Alternative A (No Action)	Alternative B	Alternative C (Proposed Action)
Implementation Schedule	Implemented two years after decision.	Implemented immediately upon decision.	Implemented immediately upon decision. Required improvements 1-3 years, other adaptive measures as needed (5-10 years).
Grazing	No Grazing. Permits cancelled in two years.	Grazing re-authorized on all eight allotments.	Grazing re-authorized on all eight allotments.
Water Developments (Springs, Ponds, Tanks, Wells)	All removed by Forest Service except those that benefit wildlife.	Existing structures to be maintained or reconstructed as needed.	Existing structures to be maintained or reconstructed as needed similar to Alternative B. A total of 11 new water developments to be constructed.
Fences (miles)	All removed except for those that benefit wildlife.	Existing fences to be maintained or reconstructed as needed.	Existing fences to be maintained or reconstructed as needed similar to Alternative B. Approximately 14 miles of new fence to be constructed.
Streams / Riparian			
Soils	Eliminates all livestock effects to soils.	Soil compaction would remain well within Forest Plan standards.	Slight increase in soil compaction, but would remain well within Forest Plan standards.
Water Quality	Eliminates all livestock effects to water quality.	Water quality standards relating to beneficial uses would be maintained.	Similar to Alternative B.
Streambank Stability	Streambanks would gradually stabilize.	Streambank stability would be maintained or improved, but at a slower rate than Alternative A.	Similar to Alternative B, except in those limited areas where livestock are excluded from riparian areas by new structural improvements. Streambank stability in those limited areas would be expected to improve similar to Alternative A.
Riparian Vegetation	Gradual recovery and expansion of riparian vegetation.	Recovery and expansion of riparian vegetation would be expected to occur at a slower rate than Alternative A.	Similar to Alternative B, except in those limited areas where livestock are excluded from riparian areas by new structural improvements. Riparian vegetation in those limited areas would be expected to recover and expand similar to Alternative A.
Upland Vegetation			
Bare Ground	Bare ground would gradually decrease.	Bare ground would decrease, but at a slower rate than Alternative A.	Similar to Alternative B.
Noxious Weeds and Non-Desirable Plants	Noxious weeds and non-desirable plants would remain unchanged.	Noxious weeds and non-desirable plants may gradually decrease compared to Alternative A.	Similar to Alternative B.
Desirable Plant Species Diversity	Desirable plant species may gradually increase in diversity and abundance.	Desirable plant species diversity and abundance would gradually increase, but at a slower rate than Alternative A.	Similar to Alternative B.

	Alternative A (No Action)	Alternative B	Alternative C (Proposed Action)
Social/Economics			
Risk of Livestock-Vehicle Collision	Eliminated	Same as current risk.	Substantially reduced risk.
Potential For Actual Grazing Use Reduction	Total elimination of grazing.	Bald Horse: Low Deerfield: High Palmer (North): Moderate Palmer (South): Moderate Porcupine: Low Redfern: High Rimmer: Moderate Slate Prairie: High Tigerville: Low	Similar to Alternative B, except reductions in actual use, where it occurs, may be less because of better livestock distribution and exclosures.
Cost to Permittees	Standard operation and maintenance costs (including grazing fees) for two years. Substantial replacement costs for cancelled grazing permits.	Standard operation and maintenance cost (including grazing fees) along with reconstruction of some existing improvements.	All costs included in Alternative B plus an approximate $175,000 in new improvements (fences, water developments, cattleguards).
Cost to Forest Service	Cost to administer for two years and costs to remove unneeded improvements, and the cost to maintain retained structures for wildlife.	Standard administration costs plus additional $57,000 in long-term monitoring costs over ten year period.	Similar to Alternative B.

CHAPTER 3 AFFECTED ENVIRONMENT and ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the affected environment for each resourced analyzed. Subsequently, the environmental consequences of the alternatives on the resource components of the physical, biological, and social environment in the Mystic Range Project Area are disclosed. Environmental consequences are described in terms of the beneficial/adverse, short and long-term direct/indirect and cumulative effects. Effects are quantified where possible, although qualitative discussion is often necessary. Elements that are not affected or minimally affected by the alternatives, such as climate, noise, and topography are not discussed. This chapter provides the scientific and analytical basis for the comparison of alternatives presented in Chapter 2.

Direct and indirect effects of the proposed action and its alternatives were analyzed over the planning period (10-15 years). Cumulative effects differ from direct and indirect effects in that they take into account past, present, proposed, and reasonably foreseeable activities, in addition to direct and indirect effects, that could affect issues and resources. Cumulative effects are discussed under each resource topic; they will be summarized in this section.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the Council of Environmental Quality issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions. The memorandum states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4 (f)) (July 24, 2008), which state, in part:

CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives would add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonably foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR 1508.7).

The Mystic Range Project's purpose and need is very much a factor of the existing condition, and the existing condition is related primarily to effects of past management practices.

For these reasons, the analysis of past actions in this section is based on current environmental conditions. See Appendix C for activities that are occurring, have recently occurred, or are in the planning stage in or adjacent to the project area.

The resource components described in this chapter are arranged in three sections:

- Biological Environment
- Physical Environment
- Social Environment

BIOLOGICAL ENVIRONMENT

RANGE

Introduction

Rangeland is defined in the Region 2 Rangeland Analysis and Management Training Guide (RAMTG) as land producing or capable of producing, native forage for grazing and browsing animals, and lands that have been revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. It includes all grasslands, forblands, shrublands, and those forested lands which can – continually or periodically, naturally or through management – support an understory of herbaceous or shrubby vegetation that provides forage for grazing or browsing animals.

Affected Environment

Today's range conditions are the result of consolidated, historic efforts to improve rangeland condition and trend that resulted from the initial start-up of forest grazing – both prior to and during the beginning of the Forest Service's role on the now Mystic Ranger District. The original direction to the Forest Service included providing support to the developing ranches and local communities in the Black Hills area through sustained, regulated livestock grazing. This emphasis is continued today through Forest Plan direction for proper use of rangelands.

The following is information summarized from the Range Report pertaining to the Mystic Range Project for these eight allotments (Bald Horse, Deerfield, Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville) which are located on the Mystic Ranger District, Black Hills National Forest, USDA Forest Service in Region 2.

Table 3-1 Current authorized livestock use - Mystic Range Project Allotments

Allotment	Grazing System	Pastures Involved	Numbers	Season of Use	AUMs **
Bald Horse 27,828 acres	nine pasture deferred rotation	Buzzard's Roost Burnet Ranch Middle Bald Hills Middle Horse Middle Victoria North Bald Hills Prairie Creek South Bald Hills West Horse	299 cow/calf; one permit	June 1 – October 26	1,921
Deerfield 7,874 acres	six pasture deferred rotation	Baseline Gold Run Heely Highline Lake Shore Trap	102 cow/calf; one permit	June 6 – October 25	628
Palmer Gulch 14,190 acres	12 pastures: Three separate deferred rotations	North Rotation: Dump Ford Keystone Sawmill	74 cow/calf; one permit	June 1 – October 31	491

Allotment	Grazing System	Pastures Involved	Numbers	Season of Use	AUMs **
		Samalias			
		South Rotation: East Zimmer Lower Bear Palmer Upper Bear Rabbit Sunday	67 cow/calf; one permit	June 1 – October 21	416
		Winter Use: Summit	3 cow/calf	October 22 – May 31	29
Porcupine 9,858 acres	12 pastures: Holistic Resource Mgt. uses mix of rest and deferred rotation	Antelope Springs Babbington-NW1 Wildcat-NW1 North Wolf 2 North Wolf 3 Signal South Exchange South Wolf 1 Wells Cabin West Hells 1 West Hells 2 Yount	Variable numbers and season of use. Average use equivalent to 334 cow/calf pairs for 114 days. one permit	June 9 – October 30	1,652
Redfern 11,573 acres	five pastures: deferred rotation	Nugget Queen Bee Slate Creek White Earth Redfern Holding	195 cow/calf one permit	June 11 – October 25	1,159
Rimmer 2,011 acres	two pastures: deferred rotation	Grandad Rimmer	33 cow/calf one permit	June 11 – October 10	175
Slate Prairie 5,896 acres	five pastures: deferred rotation	Hay Draw Mystic Slate School West Slate Whitetail	200 cow/calf one permit	June 1 – October 20	1,232
Tigerville 5,825 acres	six pastures: deferred rotation	Lena Marshall Mini Redfern Tigerville Westside	112 cow/calf one permit	June 1 – October 25	715

**An AUM is the amount of feed or forage required by an animal-unit for one month.

Livestock numbers, pasture rotations, and season of use can be modified on an annual basis to adapt to climatic conditions or administrative needs. This is done through the Annual Operating Instructions (AOI) that are developed annually during meetings with permittees. These instructions implement the management direction set forth in the Allotment Management Plan (AMP) that is developed from the project-level NEPA decision. A grazing permit is the instrument that authorizes use and occupancy by the specific holder of the grazing permit to graze livestock on certain National Forest System or other lands under Forest Service jurisdiction. The holding of such permits is a privilege, not a property right. Permit holders may waive the validated permit back to the Forest Service in favor of a purchaser of permitted livestock, base property, or both.

The AMP and AOI are incorporated into the terms and conditions of the grazing permit. Issuance of grazing permits, AMP's, and AOI's are not a final federal agency action. They are administrative actions implementing a project level or Land and Resource Management Plan (LRMP) level decision. The Revised Black Hills Land and Resource Management Plan (USDA Forest Service 1997), as amended provides management direction for these eight allotments.

Field Surveys/Resource Contacts

The following methods were used to evaluate resource conditions on the allotments. Field surveys were conducted annually while more intensive methods were conducted during the summer and fall of 2004-2009. The analysis was done on sites that are representative of the primary range found on the allotments. Computer modeling was used as part of the capability assessment.

Suitable and Capable Rangelands

Suitable rangelands are those rangelands where there is no Forest Plan or other binding decisions to preclude the permitting of livestock grazing. Rangelands are deemed suitable based on applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses forgone. A unit of land may be suitable for a variety of individual or combined management practices.

Management area designations as determined by the 1997 Black Hills National Forest Plan and Phase II Amendment for the project area include those in Table 1-1. All of the Management Areas within these eight allotments are classified as suitable for livestock grazing. Within the Deerfield Allotment, there are 160 acres dedicated for Botanical Area emphasis; currently there is no grazing authorized on these acres because a separate botanical area management plan (not yet developed) would need to specify the purpose and need (if any) for livestock grazing use. No changes in range suitability were needed based on this analysis. Livestock may incidentally use non-suitable lands throughout the Mystic Ranger District but no management or stocking is based on those lands. When such use is detected, the permittees are responsible for removing livestock from those non-suitable lands. Such use is generally sporadic and in most cases livestock grazing are infrequent events.

The potential of an area of land to produce range resources, supply goods and services and allow resource uses under an assumed set of management practices and at given levels of management intensity defines capable rangelands. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices such as silviculture or protection from fire, insects, and disease.

Assessing rangeland capability can be a useful tool at the project level to identify where forage is available and how management can affect use of that forage. Capable acres for this analysis area were reviewed using the latest GIS data, field reviews, and an examination of historic file records. Factors such as tree canopy cover, vegetative type and production, slope and aspect were all used to determine acres that were capable for grazing. However, range capability is a modeling tool only and may not portray an accurate assessment of on the ground conditions. For example, grass production varies based on many factors that are not easily modeled such as local variations in soil type, precipitation, seasonal temperatures, microsites, presence of new pine encroachment, plant species (native, introduced; warm or cool season plants or both).

The initial capable acres data (29,782 acres out of 85,055 acres) provides a reasonable estimate of carrying capacity for these six allotments: Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville. The Bald Horse Allotment is projected under stocked but much of this capacity is within forested areas not used by the permittee. The Deerfield Allotment was also estimated as under stocked; some of that capability again relies on livestock use of forested areas. In summary, the numbers generated by the "capability maps" and subsequent analysis indicated that three allotments would be overstocked and five allotments under stocked – all to varying degrees.

Once an area is determined to be capable of supporting forage production, grazing capacity (also known as carrying capacity) may be further refined. Grazing capacity may be expressed as the livestock stocking rate that is consistent with maintaining or improving vegetation or related resources. It may vary from year to year in the same area due to fluctuating forage production.

Past rangeland inventories completed at one point in time can be useful to provide general estimates of present or potential grazing capacity of management units. However, grazing capacity estimates based upon one-point-in-time rangeland inventories do not produce results of sufficient accuracy to be the sole basis for adjusting time of grazing or stocking rates on specific grazing units.

Some examples of reasons for variation in modeled capabilities versus results experienced on the specific allotment are: 1) initial rangeland inventory may have been completed during a period of above or below normal precipitation and normal temperatures, resulting in forage production greater or less than expected or vice versa; 2) the advancement of ponderosa pine trees into burned areas or open meadows is progressively reducing forage production; 3) production of forage after forested areas are logged open is reduced as trees reforest site; 4) the size of livestock grazed vary as some cattle are larger than when first capability projections were made many years ago; and 5) wildfire or prescribed burning opens canopies of trees and starts new forage production such as the outcome from the Jasper Fire. The point is capability and grazing capacity assessments are a starting point that requires monitoring and adjustments based on observations.

Additional capability adjustments are often needed to account for distance to water, livestock behavior, topography, and protection and promotion of other resource values such as riparian, botanical, riparian, and archeological resources. For example, there may be a large meadow with high productivity but due to steep access and long distance to water livestock do not utilize it. Stubble height requirements for retention of residual vegetation may require livestock removal before all available forage is grazed.

On these eight allotments, vegetative encroachment into rangelands is a constant process in motion, reset only by fire, commercial and non-commercial treatments such as timber sales, and insect outbreaks such as mountain pine beetles. For example, while permitted numbers have remained relatively static, the size of rangelands may be somewhat increased by vegetative treatments and bark beetle infestations, or reduced by pine encroachment, or increased by the Jasper Fire of 2000. Grazing capacity estimates are not considered as static; their determined estimate should be periodically considered as part of range management.

Grazing capacity data generated from past field analysis work in the 1950s and 1960s indicated some the eight allotments were overstocked, and corrective actions initiated at that time. Corrective actions were often documented in new AMPs in the late 1960s and early 1970s.

Other allotments were assessed as under stocked or considered correctly managed given standards and guidelines in place at the time of the analysis and AMP.

Capability modeling outputs, examinations of annual monitoring and long-term trend data, as well as field site visits were used to conclude that current stocking rates are within range of grazing capacities for the Bald Horse, Deerfield, the south half of Palmer Gulch, Porcupine, Rimmer, and Tigerville Allotments. Similar data for the north half of Palmer Gulch, Redfern, Slate Prairie Allotments suggests that these three allotments are overstocked with livestock and could be exceeding grazing capacities.

Grazing Capacity Determinations

The RAMTG states when resource conditions on some allotments are not meeting, nor moving towards Forest Plan objectives, rangeland managers should re-evaluate grazing capacity, that is, the amount of livestock use that can be allowed while meeting basic resource needs and associated objectives. Studies to firm up grazing capacity estimates should be conducted for at least a full rotation on rest or deferred systems, and scheduled to allow for vegetative production fluctuations due to climatic conditions. Such estimates are not to be considered static; they should be periodically reviewed and adjusted to bring them in line with changing conditions. Stocking rates should allow a safety margin to provide for low forage producing years, and trend towards objectives is another consideration.

Long Term Monitoring

Field surveys of upland vegetation using cover-frequency methodology (USDA Forest Service 1996a) were conducted during the 2004-2009 field seasons. This methodology provides a current vegetation inventory as well as a baseline from which to measure trend. Cover Frequency transects can provide quantitative measurements of canopy cover and frequency by plant species, as well as ground cover. Changes in bare ground, plant composition, and canopy cover or frequency over time can help determine if rangeland management objectives are being met or if changes in management are required. If possible, previously established cover-frequency transects were reread. If they did not exist, either old transects of a different methodology were reread using cover-frequency methodology, or new cover-frequency transects were established. This allowed for a comparison of species composition change over time.

Proper Functioning Condition

Proper Functioning Condition (PFC) assessments (USDI Bureau of Land Management 1998) were also conducted during the 2008 field season. PFC is a qualitative approach for considering hydrology, vegetation, and erosion/deposition (soils) attributes and process to assess the condition of riparian-wetland areas. They provided a quick qualitative assessment of existing conditions and an estimate of trend of each surveyed area. They were used to help determine where additional, more intensive study methods such as MIM (Multiple Indicator Monitoring) may be needed. PFC assessments are discussed in the Watershed, Geology, and Soils section.

Multiple Indicator Monitoring Study (MIMS)

Even though riparian lands may make up a small portion of each allotment, they are important because they provide habitat for wildlife species and exercise important controls over physical and biological conditions and functions in the stream environment. Riparian vegetation can provide shade to moderate water temperatures, roots to stabilize streambanks, cover for wildlife, and filter

out sediment from entering the stream. Riparian areas can buffer irregular pulses of water over space and time, and help keep water more evenly distributed on the land longer. Essentially they can efficiently catch, store, and release floodwaters, and improve water quality for livestock, wildlife, and other downstream users (USDA Forest Service 2005g).

The ID Team agrees that livestock grazing is compatible with sustainable riparian lands when done properly. Literature shows conflicting points of view regarding the advantages and disadvantages of livestock grazing of riparian areas. The ID Team concurs with literature findings that excessive disturbances, if allowed to continue, do create detrimental impacts that outweigh benefits. To achieve desired conditions for riparian areas, they need to be managed in the context of the entire watershed, and balance the need to manage vegetation for livestock and wildlife needs with reaching and maintaining a healthy, diverse, and productive ecosystem (USDA Forest Service 2005g).

To address standards and guidelines for management of riparian areas as set forth in the Forest Plan, long-term monitoring was necessary. The selected methodology for riparian analysis is MIMS, and was originally developed in Idaho to address the findings of a stubble height review (University of Idaho Stubble Height Study Team, 2004). The report states that integrating annual grazing use and long-term trend indicators allow for evaluation of livestock grazing management. The MIMS protocol includes long term monitoring techniques useful in describing the condition and trend of streambanks, stream channels, and streamside riparian vegetation. This protocol allows for measuring at established transects up to eight monitoring indicators in a single pass if desired. Five of the indicators are long-term trend measures: greenline vegetation, woody species age and height class, streambank stability, greenline to greenline channel width, and substrate. Three indicators are short-term measures of annual use by herbivores: woody species browse, stubble height, and streambank alteration. Threshold (may be also called trigger) levels are preset in the model and are based on research and collective assessment by model developers and field tested. These threshold or triggers are used to indicate whether measured values are less than, equal to, or greater than desired conditions. Practitioners of MIM may select appropriate indicators based on objectives for each site.

Indicators are measured at a representative Designated Monitoring Area (DMA). DMAs are placed in the riparian complex that is most sensitive to management influences. In addition, permanent photo points are included to create a long-term visual record. This protocol was developed and tested on perennial snowmelt dominated and spring-fed streams in the western United States. The ID Team selected this methodology as an appropriate means to document condition and trend of select riparian areas and creeks within the project area, and this method is accepted by the Forest Service's Rocky Mountain Region.

MIMS transects were established in seven of the eight allotments in 2008. One allotment, Porcupine, contains virtually no riparian areas.

Forage Utilization

Utilization measurements taken over a period of time help to develop a picture of the health and vigor of the forage resource, and would indicate if the grazing system is compatible with resource objectives. These measurements help with evaluating grazing capacity determinations by past range managers, and firm up estimates from capability modeling. Consistent over-utilization of

plant communities can change their composition by allowing less desirable species to dominate or replace desirable species. It can also lower forage production and limit the amount of residual forage available for wildlife.

Key areas may be used to determine pasture utilization. They are generally used on each allotment to execute short-term monitoring on a periodic basis. Their location may be adjusted from year to year based on the discretion of FS range personnel and in cooperation with the permittee to reasonably reflect the actual effects within a pasture, and to detect when thresholds for use would be exceeded. Livestock should be moved to the next pasture prior to exceeding thresholds.

Short-term utilization studies, including use of the Ocular Estimate Method (USDA Forest Service 1996a), were conducted over several years to monitor utilization in key area(s) per pasture and determine compliance with Forest Plan Standards and Guidelines. Forest Guideline 2505 displays Proper Allowable Use using a deferred rotation is 0-50% per utilization by weight each year for ranges in satisfactory condition.

Desired Condition

Desired condition is the portrayal of rangeland resources on a landscape scale that meets management objectives as identified in the Forest Plan and the Allotment Management Plans (AMPs). Desired condition is based on ecological, social, and economic considerations (USDA Forest Service 1996a). The Forest Plan describes the desired condition of lands and resources and also describes standards and guidelines for various resources that are intended to guide management into meeting or trending towards desired conditions. The following table shows the generalized qualitative differences between rangelands in excellent and poor conditions.

Table 3-2 Comparison of Rangeland Conditions

Excellent Rangeland Condition ◄---◄--------_---------►---► Poor Rangeland Condition	
Desirable plants abundant.	Desirable plants absent or few.
Desirable plants vigorous.	Desirable plants stressed.
Diverse age structure in plant community.	Structure confined to single age.
Increased diversity of plant species.	Little diversity in plant species.
Litter present and contacting soil.	Litter absent or not contacting soil.
Sufficent vegetation.	Insufficient vegetation.
Little bare ground	Excessive bare ground.
Water soaks into ground.	Water runs off ground.
Sufficient litter ground	Insufficient or excessive litter cover.
Soil surface protected by plants or litter.	Soil surface exposed.

Desired plant community (DPC) selection emphasizes maintaining or moving towards excellent rangeland condition, and is crucial to effective rangeland planning. DPC must currently exist in the general area in similar environmental settings, and are capable of occupying the site within a reasonable time period through management changes (RAMTG). The overall desired condition for the project area was developed by the interdisciplinary team (see Table 1-2, Chapter 1).

Much of the primary grazing areas in the Black Hills NF have been converted to non-native graminoid species through historic management practices. For example, numerous meadows were planted with timothy and/or smooth brome and managed as hay grounds (Graves, 1899) (MacIntosh,

1928). Local residents remember stories of the Forest Service providing grass seed to permittees, and encouraging them to reseed any bare ground to avoid the Dust Bowl results experienced in the plains during the 1930s (Reynolds, 2007). These non-native species have naturalized and easily spread to adjacent areas (Larson and Johnson 1999).

It is currently not feasible for these areas to return to a "natural" state without major effort including ground disturbance and reseeding projects, use of expensive mechanical and chemical practices, and commitment of the agency and permittees.

Many of these non-native species are acceptable for the current and proposed management of the project area. The following species are considered acceptable: *Phleum pretense*, timothy; *Bromus inermis*, smooth brome; and *Poa pratensis*, Kentucky bluegrass. While not as desirable for wildlife habitat and rangeland health on public lands as native species, they do provide some benefits (SAIC 2003). These species were first used for livestock forage, hay, and erosion control because of their ability to compete and their aggressive nature.

The 2003 SAIC report notes a strong association between seasonal forage quality and quantity and subsequent growth and survival of deer and elk. It also notes whitetail deer and elk typically thrive on seral vegetation such as native grasses, forbs, and shrubs. It recommends enhancing forbs and tall shrubs on transitional and winter ranges, continued allocation of forage allotment-wide specifically for wildlife use, and that judicious use of livestock grazing can be a tool to maintain good wildlife habitat.

The following palatable ratings are for the State of Wyoming, and can also be found in the Forest Service's Fire Effects Information System (http://www.fs.fed.us/database/feis/). The ID Team believes these are reasonable approximations ratings for vegetation found in South Dakota on the Black Hills National Forest.

Timothy*	Elk	Good
	Mule Deer	Good
	White-tails	Good

*Cover value is poor in Wyoming for elk and fair for deer and good for upland game birds.

Kentucky bluegrass	Elk	Good
	Mule Deer	Good
	White-tail	Good

Smooth brome*	Elk	High
	Mule Deer	Moderate

*Based on R2 Rangeland Analysis Management Training Guide (RAMTG), Appendix L.

All ratings, regardless of source, are based on initial forage preference and palatability for wildlife; they vary by season. The nutritive values of these non-native plants do decline with curing, as does their desirability for use by various wildlife species. Fall regrowth of some non-native plants may be used by wildlife based on visual observations by the ID Team.

These RAMTG ratings are based on the relish and degree of use shown by livestock and wildlife for a plant or plant part. The high reading indicates the plant is highly relished and consumed to a high degree and the moderate rating correlates to a plant that is consumed or relished to a moderate degree. Watershed protection is based on the growth habit, structure, biomass, or root system characteristics or individual plant species to reduce soil erosion. A plant with a moderate rating would exhibit moderately aggressive growth, a moderate degree of persistent plant structure, potential biomass or a moderate soil-binding root rhizome runner system

While it is not the goal or objective of this project to solely manage for these non-native grass species (reference Table 1-2 Desired Plant Community), reducing them through grazing management may be applicable as a trial effort in specific instances. The purpose of reducing their presence is to increase the presence of native plants. For example, early season grazing can favor an increase in warm season grasses over cool season grasses since cool season plants initiate growth first and are available to livestock. Recent research in mixed grasses prairies indicates a lack of grazing by herbivores favors non-native plant expansion and invasive plants, while grazing can increase diversity and favor restarting the native plant community (DeKeyser, 2009).

Limited use of livestock grazing to reduce densities of non-native grasses and Canada thistle has been used on a temporary permit basis with some success (Luhrsen, and Vedder 2001) and shows promise for site specific needs. This use of livestock grazing as a targeted tool may provide managers with some options to reduce non-native plant densities. Other options for their removal include treatment with herbicide and/or ripping up the ground and reseeding. Removing grazing altogether is also an option discussed under Alternative A.

Herbicide treatment is expensive and could have detrimental effects on native grass and forb species that do exist in these plant communities. Disturbing the soil has proven to increase noxious weeds, especially in those areas where they may already exist. Reseeding after spraying and ripping is highly recommended, however, this too is expensive and often the seed available for this sort of project comes from other areas and is genetically different. Establishing native species back into an area may take several years and repeated herbicide treatment for weeds.

Climate Change

Forest Service researchers have studied the impacts of climate change and air pollutants on forests and grasslands over thirty years. This research already identifies trends and subsequent effects to ecosystems across the United States. Currently, the Rocky Mountain Research Station has scientists studying climate as it influences plants, animals, ecosystems, disturbance patterns, and social and economic systems. Results from this research are intended to support land management and planning needs for addressing and coping with climate change. “Adaptive Management” may allow for easier incorporation of new scientific findings into rangeland management, and potentially foster creation of adaptive measures for implementation.

Currently, the subject of Climate Change is in the news media on a daily basis, and a variety of pro and con articles and respective supporting research or views can be found. One example is the Regional Great Plains predictions or most likely assumptions are found in the 2009 United States Global Climate Change website. This website states: 1) increases in temperature, evaporation, and drought frequency are possible out to year 2099; and 2) there may be a decline in water resources if a) continues unabated for the northern tier; b) agriculture, ranching, and natural lands,

already under pressure due to an increasingly limited water supply, would also be stressed by rising temperatures. These highlights appear to include the Black Hills and surrounding area (USGCRP, 2009).

A national framework for guiding and directing land management activities in light of expected climate changes has been released by the Forest Service, anticipating changes in management based on regional and local effects of a changing climate (Kimball, USDA Forest Service 2008b). This Forest Service strategic framework has seven goals to address projected climate changes. Two of these goals overlap to some degree the underlying needs of this project. They are: 1) adaptation - enhancing the capacity of forests and grasslands to adapt to the environmental stresses of climate change and maintain ecosystem services; and 2) mitigation - promoting the management of forests and grasslands to reduce the buildup of greenhouse gases, while sustaining the multiple benefits and services of these ecosystems.

An adaptation example could be declining snow packs and changing patterns of precipitation and runoff indicate a period of water scarcity. Since the national forests were created in part for "securing favorable conditions of water flows," managing vegetation to restore enhance ecological processes and functions, including the recharging of streams and aquifers relates well with one of the underlying needs of the Mystic Range Project: maintaining or improving resiliency in resource conditions for rangeland and watershed health, which is one of the Forest Plan goals.

An example of mitigation within this project is the use of "Forage Reserve" designation for any vacant allotment. This is listed as a Design Criteria item for this project, and is already in use on two other Mystic District allotments not covered by this analysis project. Another example is with an increase in riparian vegetation including overhanging and shading cover, there should be a reduction in water temperature that is favorable for restoring fisheries habitat where populations may exist (Bisson 2008).

One approach for adaptation is to assemble a toolbox of short-term and long-term (greater than 50 years) strategies. These are addressed within each alternative. Examples of short-term adaptation tools that intended to build resistance and resilience of ecosystems are: 1) management of the regeneration process by increasing diversity and restoring key processes following disturbance – such as improving riparian conditions; 2) connecting fragmented stream channels; 3) reducing bare ground; 4) controlling noxious weeds; and 5) updating measures for dealing with extreme climate events such as drought, fire, or flood and their effect on forage production. Long-term adaptation tools are: boosting population sizes, protecting or restoring multiple examples of ecosystems, or any action that increases biological diversity. Long-term implementation depends on the trajectory of climate change because of the level of uncertainty with any aspect of climate change (Blate, 2009).

Bald Horse Allotment

The Bald Horse Allotment covers a variety of topography over 27,828 acres, and is over 12 miles in length running east to west, and approximately seven miles wide from north to south. It is directly west of Rapid City, South Dakota. This allotment bounded by Whispering Pines on the east, Sheridan Lake Road on the south, extends across Highway 385 on the west, and borders the south side of Rapid Creek but crosses over into Buzzard's Roost east of Hisega subdivision. A notable feature is the Bald Hills – a series of ridges and bowls mostly devoid of pine trees. Within the allotment boundary there are four major drainages: Horse Creek, Victoria Creek, Prairie Creek, and

Rapid Creek. T he terrain varies from rolling grasslands covered hills, lush meadows of varying widths, tree covered slopes of various aspects and roughness, and stringers of aspen and oak stands. Watering sources for livestock and wildlife consist of ponds, water tanks fed by spring sources, and access to seeps and free flowing creeks and are usually adequate except in drought years when some springs run limited flows. Approximately 9,300 acres are considered capable of producing useable forage for livestock grazing. Over 70% of these forage producing acres are located conifer, hardwoods, and non-stocked pine ponderosa.

This allotment was formed in 1992 by combining three separate allotments: Bald Hills, Horse Creek, and a portion of the Pactola Allotment south of Rapid Creek drainage. At that combination, livestock from the Bitter Creek Allotment were also re-assigned here as well to alleviate an overstocked situation adversely affecting range conditions. Livestock on the Bald Hills and Pactola Allotment were allowed to graze their assigned pastures, and the combined herd was also grazing the Horse Creek Allotment. At the time of the formation, the Horse Creek Allotment was then vacant and held by the Forest Service due to permit action against the permit holder. In 2000, the Forest Service administratively formed the Bald Horse Allotment by formally combining the permits and acreages assigned to Horse Creek, Bald Hills, and a portion of the Pactola Allotment. The present permitted number of livestock is 299 mature cattle (cow/calf operation) grazing from June 1 to October 26 each season for 1,921 AUMs.

File records indicate the Bald Hills Allotment was grazed by a continuous season-long use by cattle from inception of the National Forest until 1966 when a three pasture Hormay rest-rotation grazing system was implemented. Initially, this allotment was stocked with 350 cow/calf pairs until the mid 1930's, and then numbers reduced eventually to 125 pairs in 1947 for 830 AUMs. At the same time, the start date changed from mid May to June 1, with all cattle off by October 31. Vegetation was characterized by bluegrass drainages and little bluestem hillsides. Several attempts were made to re-forest the Bald Hills with no success – apparently because of soil chemistry. Iron mining of ridge tops (hematite) was attempted prior to the 1950s with no success. Some spraying of snowberry, mullein, fringed sage, and grasshoppers was completed in 1959. Various range improvements have been constructed by the permittee with Forest Service assistance to cross fence the pastures and develop water. The intent was to continue with a rest rotation system but eventually the decision was made to go with a deferred rotation grazing system where all three pastures were grazed. Numbers were adjusted in 1981 after multiple years of additional numbers grazed under temporary permits to test capacity, and then 163 cow/calf pairs were grazed annually from June 1 to October 31 for 1,082 AUMs. The date of the last Allotment Management Plan (AMP) is August, 1975.

The second allotment used to make the Bald Horse Allotment is the Horse Creek Allotment. The Horse Creek Allotment was formed by combining the Victoria Creek Allotment with Horse Creek in 1986. The Victoria Creek Allotment extended from the National Forest Boundary on the east end of Victoria Creek, and extended westerly to Middle Victoria. Horse Creek Allotment originally included Burnt Ranch area and extended westerly across Highway 385 and up the Horse Creek drainage. This plan allowed for use by 428 yearlings from June 1 to October 31 each year for a total of 1,500 AUMs. Past file records are limited, but indicate a similar program of cooperative range developments, such as, fencing and water developments was on-going with the permittees. At one time livestock grazing was allowed right up to and within portions of the Sheridan Lake Recreation Area. The 1959 Horse Creek records reflect grazing issues with lack

of water and overstocked by an estimated 52%; there were 242 cattle permitted for five months or almost 1,600 AUMs. Concurrently, the 1959 Ranger Plan for Victoria mentions "….key areas of this allotment have been overused for some time…" and "….the amount of use will have to be adjusted in order to achieve proper use of these areas." Records from 1966 show 220 cattle were permitted from June 1 to October 31 for 1,460 AUMs for Victoria Allotment alone, and repeated measurements of grazing use by weight in the 70 to 80% range. The 1986 plan reduced permitted AUMs by approximately 48% (3,060 to 1,600 AUMs). The date of the last AMP is January, 1986.

Portions of the Pactola Allotment were also added to make up the Bald Horse Allotment. A riparian pasture created lies directly below and east of Pactola Dam (known as Pactola Basin). Additionally, areas south of Rapid Creek and easterly to Hisega, and rangelands from Gold Standard Gulch over to Prairie Creek drainage were part of the Pactola Allotment. Two separate cattle herds were grazed in this area: 46 cow/calf pairs were grazed in Gold Standard, Brush Creek, and Prairie Creek from June 1 to September 30 each year. Another 40 cow calf pairs were grazed in Rapid Creek drainage (including Pactola Basin) during the same timeframe. Estimated capacity of this portion of Pactola Allotment was 455 AUMs. The date of the last AMP is February, 2002.

This Pactola Basin riparian pasture was created by the South Dakota Game, Fish, and Parks and the Forest Service in the late 1980s. Considerable financial investment was made into the basin to restore the stream channel and riparian areas to their original channels, and upland grazing use limited to 20% allowable use by weight. The District Ranger later decided in the late 1990s to cease grazing the Pactola Basin Pasture, due to the high values associated with the riparian area for recreation and fisheries habitat, and the permittee concurred.

The Bald Horse Allotment is currently managed in a sequence of nine pastures using a deferred rotation of livestock grazing use. Grazing may start June 1, depending on range readiness, and usually continues through October 26 for 299 mature cattle (cow with calf) owned by one permittee. The maximum number of AUMs is 1,921 under a ten year term grazing permit. Virtually the entire allotment is classified as big game winter range. Livestock are moved to next pasture when allowable proper use of 50% by weight is reached, but there has been a tendency to always start in pastures west of Highway 385 and work easterly each year. This repeated pattern may be one cause of riparian issues in the Middle Horse Pasture. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. This allotment is believed to be under stocked by approximately 55% of the permitted livestock numbers based on capability grazing modeling, but a large portion of this unused capacity is located in the Prairie Creek Pasture. This pasture is not used extensively by the permittee because numerous additional fences would be required to contain livestock within the allotment boundary adjacent to Rapid Creek drainage. The Prairie Creek Pasture is roughly one quarter the size of the entire allotment.

The allotment's upland sites have been monitored for utilization seven of the last ten years. The ten year allotment average for utilization is approximately 45%. In general, pasture use has been within prescribed limits although some instances of exceeding allowable proper use were recorded in 2007 for Burnt Ranch and Middle Victoria Pastures. Recent field reviews have found the upland plant communities exhibit a diverse mix of native and non-native grasses and forbs, such as, green needlegrass, intermediate wheatgrass, smooth brome, timothy, Kentucky bluegrass, big and little bluestem grasses, sedges, western wheatgrass, Western snowberry, wild rose species, and a variety

of forbs. Areas subjected to recent prescribed burns (Middle Horse Creek Pasture, Bald Hills Pastures) and timber sale activities have shown a flush of new plant growth and diversity in grass, forb, and shrub species. The most recent timber sales have been cutting to a 40 to 50 basal area to lessen the possibility of crown fires, and this has encouraged new grass, forb, and shrub growth in areas previously limited by canopy closures of pines, and these areas show similar results as found after recent prescribed burns.

The condition and trend of upland vegetation of most pastures is represented by transects at Lower Victoria #2 and South Bald Hills #2, and they have been rated by the ID Team as "Meeting Desired Conditions". While the native grasses generally do not dominate in the plant community, they are present and co-exist in varying degrees with non-native grasses. A diverse assortment of forbs together with grasses and developing shrubs provide a mosaic of plant species, a variety of vegetative structures, and generally effective ground cover to maintain soil stability and provide wildlife habitat. One site, Middle Horse #4 lacked an abundance of forbs and showed bare ground in excess of desired conditions in 2005. Bare ground is an important indicator of the potential of a site to prevent erosion. A higher percentage of bare ground on a site indicates that there is a higher potential for soil erosion. This site was measured during the drought and appears improved (visual inspections 2008-09) since then no formal measurement was taken during this analysis.

The allotment's riparian sites have been visually observed over the past ten years. Pactola Basin is considered in excellent condition, and Prairie Creek was rated in 2008 during the PFC assessment as at desired "Proper Functioning Condition". Victoria Creek in the Lower Victoria Pasture was reviewed and assessed as "Functional – At Risk" with an upward trend because of off road vehicle (ORV) use in the channel and damage caused by the 1972 flood event. Portions of this drainage would not flow in drought years, and livestock are trailed through the narrows above Victoria Creek Dam. Concerns regarding the condition and trend of some riparian areas found in Middle Horse Creek and Middle Victoria Pastures led to the establishment of Designated Monitoring Areas (DMA). Each DMA has a Multiple Indicator Monitoring Study (MIMS) transect to document baseline conditions, and compare results against desired threshold levels. Middle Horse DMA#7 shows Kentucky bluegrass as dominant and riparian vegetation is sporadic in presence; and the desired percent of hydric plants is below the threshold level (11% versus 80%). Streambank stability is below desired level, and alteration ratings exceed threshold level. DMA #7 was rated as "Not Meeting Desired Conditions". Middle Victoria DMA #8's transect found similar results to Middle Horse, but percent of hydric plants was 25% and streambank stability met and exceeded threshold level. DMA#8 was rated as "Moving towards Desired Conditions".

Range improvements have been maintained and are in relatively good condition throughout the allotment, with some exceptions. There are 20 spring developments, three ponds, 14 water tanks, and over 37 miles of fencing. The permittee has been actively replacing worn out improvements after clearance is obtained, and materials are available from the Forest Service. Much of the fencing is constructed of steel posts so despite age most fences are in good condition. The permittee's base property adjoins the allotment, and a corral is well located to receive and transport out livestock. All livestock are trucked to and from the permitted area.

Livestock are gaining entry into Pactola Basin area because existing fencing, gates, or trail gates are not adequate. A fence on the western boundary of the West Horse Pasture is falling apart from age. Some water sources are undeveloped for livestock use. Livestock can access Sheridan Lake

Road and Spring Creek Trailhead and their presence creates traffic hazards. It presently is managed as open range. Livestock can directly access Spring Creek and bank trampling is occurring. A lack of livestock and big game water in Lower Victoria Pasture occurs in drought years. Livestock are trailed to and from the area on a trail adjacent to Victoria Creek and conflicts have occurred between closures, crossing rehabilitation work, and unauthorized motorized users. A pond in the southeastern corner of Lower Victoria does not hold water, and there is no permanent corral for roundup of stray or sick livestock. There is no developed water in the western end of Middle Victoria Pasture. Some riparian areas in the Middle Bald Hills Pasture are trampled by livestock. In the South Bald Hills Pasture, site drainage around the water tanks is poor, and the spring exclosure does not prevent trampling by livestock.

Deerfield Allotment

The Deerfield Allotment is located south/southwest of Deerfield Reservoir and covers 7,874 acres. It is about twelve miles west/northwest of Hill City, South Dakota. It crosses over several drainages on a southeast to northwest orientation; major creeks include Castle Creek, South Fork of Castle Creek, Nichols Creek, and Heely Creek. The allotment is bordered by the reservoir and Deerfield and Castle Creek Roads on the north and Williams Draw Road on the east. The Ditch Creek Road roughly splits the allotment into two halves and is characterized by steep slopes with timbered, rocky outcrops on each side of the road. Open meadows within drainages are found in each pasture generally surrounded by Ponderosa Pine and some aspen stands. Substantial portions of the allotment have been subjected to recent timber sale work to control mountain pine beetle. Watering sources for livestock and wildlife consist of ponds, spring sources, and access to seeps and free flowing creeks. The McIntosh Fen Pasture is not grazed, and provides botanical, watershed, wildlife, and fisheries values. The South Fork of Castle Creek flows into Castle Creek and both contain excellent spawning habitat for trout. Approximately 2,500 acres are considered capable of producing useable forage for livestock grazing. Approximately 65% of these forage producing acres are located in conifer, hardwoods, and non-stocked ponderosa pine stands.

Historical file records are somewhat limited, but the 1977 AMP summarized some of the more recent history of consolidation. Starting in the late 1960s, recreational use around the Deerfield Reservoir increased substantially, so the Forest Service reorganized several allotments to reduce or eliminate conflicts between livestock and forest users. The Deerfield Allotment was created from portions of four other allotments and also one entire allotment was added. The Heely Creek Pasture, the Nichols Creek Pasture (now named Baseline), the south half of the Gold Run Allotment, and Dutchman Pasture (portions are now part of Clinton Allotment) were consolidated to make up the new Deerfield Allotment. Initial management stressed a four pasture deferred rotation grazing use, with grazing around the reservoir set for late each season to minimize recreational user/livestock conflicts.

Initial objectives were to properly graze the bluegrass meadows but long term objectives were to bring back the native grasses. Another objective was to establish a margin of safety for years of subnormal forage production by improving forage plant composition, density, and vigor. Management attempted to graze at no more than 40-50% of proper allowable use by weight. An AMP revision in the early 1990s attempted to prescribe use at 45% of weight, but that effort was not followed through by the Forest Service and use levels were returned to 50%. The revised AMP called for continued emphasis in maintaining riparian plant diversity and condition in the Ditch Creek and Castle Creek drainages by using fall grazing and low stocking levels. The

McIntosh Fen Pasture and a large tract within Heely Creek Pasture (which included a substantial segment of Heely Creek) were acquired by the Forest Service in a land exchange in the 1980s. Initial plans were to graze the McIntosh Fen Pasture but eventually forest level direction was set to emphasis botanical and watershed objectives. Eventually the Baseline Pasture was split by separating off the northern portion to form the Trap Pasture. In 2005, an isolated, ungrazed portion of the northwest side of Heely Pasture was fenced and another pasture was formed named Highline. The date of the last AMP revision is April, 1992.

The Deerfield Allotment is currently managed in a sequence of six pastures using a deferred rotation of livestock grazing. Grazing may start June 6, depending on range readiness, and ends by October 25 for 102 mature cattle (cow with calf) owned by one permittee. The current permittee elects to start grazing eight to ten days later, and usually removes the livestock several days earlier, due to concerns regarding fall snowstorms hampering round-up and trucking access. The maximum number of AUMs is 628 under current ten year term grazing permit. This allotment has no designated big game winter range areas. Livestock are moved to next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. All pastures have fairly dependable water supplies depending on their season of use. The Gold Run, Lake Shore, and Trapp Pastures are always used in late season, while livestock are placed in either Heely or Baseline to start each year, and then go to Highline Pasture. This allotment is believed to be under stocked by approximately 40% of the permitted livestock numbers based on capability grazing modeling, but there is an anticipated loss of Gold Run Pasture use due to highway construction and resource concerns regarding the condition of some riparian areas. This allotment may be under stocked because of recent timber sale activity which has increased or created secondary rangeland production.

The allotment's upland sites have been monitored for utilization seven of the last ten years. The ten year allotment average for utilization is approximately 46%. In general, pasture use has been within prescribed limits although some instances of exceeding allowable proper use were recorded in 2007 for Baseline, Highline, and Lake Shore Pastures. Recent field reviews have found the upland plant communities to exhibit mostly non-native grasses such as Kentucky bluegrass, smooth brome, and timothy. A wide variety of forbs and shrubs are present. Areas subjected to recent timber sale activities have shown a flush of new plant growth and diversity in grass, forb, and shrub species. The most recent timber sales have been cutting to a 40 to 50 basal area to treat for mountain pine beetle outbreaks, and this has encouraged new grass, forb, and shrub growth in areas previously limited by canopy closures of pine. Some locations show an increase in Canada thistle infestations after sale activity is completed.

The condition and trend of upland vegetation is represented by transect Gold Run #5, is rated as "Moving towards Desired Conditions". The presence of noxious weed infestations and the reduced amounts of native grasses resulted in the lesser rating of moving towards desired conditions. While the native grasses do not dominate in the plant community, they are available in limited amounts throughout the allotment, and appear to be increasing within newly harvested timber sites. Smooth brome and Kentucky bluegrass dominate the upland plant community in grasslands and meadows. Effective ground cover to maintain soil stability and provide wildlife habitat is present. The ID Team felt these upland vegetative conditions and trend would be similar in all other pastures.

The allotment's riparian sites have been visually observed over the past ten years. The South Fork of Castle Creek within the Highline Pasture was rated in 2008 during the PFC assessment as "Functional – At Risk" condition with upward trend. The factors contributing to this rating were an eroding beaver dam complex. Another PFC assessment at the same time was made again on the South Fork of Castle Creek but in the Gold Run Pasture. The rating here was at desired "Proper Functioning Condition".

Since concerns regarding the condition and trend of the riparian areas were found in Heely Pasture, the ID Team decided to establish a Designated Monitoring Area (DMA) with a MIMS transect to document baseline conditions, and compare results against desired threshold levels. Heely Creek DMA#4 shows Kentucky bluegrass and Nebraska sedge as co-dominant and riparian vegetation is present but of limited width with few willows. The desired percent of hydric plants is below the threshold level (34% versus 80%). Streambank stability is below desired level, and alteration ratings exceed threshold level. DMA #4 was rated by the ID Team as "Not Meeting Desired Conditions". The chief cause of DMA#4's ratings is believed to be the length of time that this pasture is grazed (60 days) which allows for repeated use of regrowth and opportunities for streambank alteration by hoof impact. Another reason for the lack of willows is perhaps their removal by mechanical or chemical or both means while the property was in private ownership prior to the late 1980s.

Range improvements have been maintained and are in relatively good condition despite age throughout the allotment, with some exceptions. There are nine ponds, and over 26 miles of fencing. The permittee's rider has been actively maintaining all fences; there are no structural water developments. In recent years, the permittee updated the corral/loading area along the Williams Draw Road. All livestock are trucked to and from the permitted area.

Livestock can access the Deerfield Road in the fall each year, and create traffic hazards and accidents within the right of way (ROW). It presently is managed as open range. A portion of the pasture boundary on the southwest side of the Trapp Pasture is unfenced and cattle can stray back and forth into the Baseline Pasture. Water storage in an existing pond in the Gold Run Pasture is reduced by pond vegetation. Heely Creek is not fenced off from livestock use except in limited willow exclosures. There are noxious weed infestations in the McIntosh Fen; the perimeter fencing on the north side is deteriorating and needs continued maintenance to prevent unauthorized off road travel access.

Palmer Gulch Allotment

The Palmer Gulch Allotment covers almost nine miles on a southwest to northeast aspect, and ranges two to four miles in width. It is east and south east of Hill City, South Dakota. The total acreage is 14,190 acres. Currently, five pastures on the north end are grazed by one permittee, while the remaining seven pastures are assigned to another permittee. The allotment is bounded by Highways 16 and 385 on the west and north, by Highway 16A on the east, by Highway 244 on the south/southeast side and continuing with the Palmer Gulch Road and Highway 89 headed to Custer State Park on the southeast boundary. A portion of the Norbeck Wildlife Preserve covers portions of four pastures, and the Black Elk Wilderness is adjacent to the allotment although not grazed. The terrain is quite variable: meadows surrounded by a range of fluctuating slopes of pine, oak, aspen, and birch, large tracts of ponderosa pine under active management to open canopies to reduce crown fire potential, several drainages that contain important streams – Battle Gulch, Bear

Creek, Palmer Creek, and Spring Creek, and considerable rock outcrops in some pastures. The Samalias and Upper/Lower Bear Pastures are in stark contrast to the rest of the allotment's pastures by virtue of very steep terrain and narrow drainages. Approximately 2,578 acres are considered capable of producing useable forage for livestock grazing. Approximately 82% of these forage producing acres are located in conifer, hardwood, and non-stocked pine ponderosa stands.

A review of past AMPs disclosed this area was primarily grazed by cattle and some horses since the inception of the Black Hills National Forest. The allotment is segmented by highways and private land in-holdings, and at one time supported six permittees plus multiple special use permits (many of which were free use). The large amount of private land fencing (and probable lack of maintenance) against this allotment was noted as a complicating factor in achieving livestock control. Permitted stocking of cattle reached its highest point during World War II when 428 head of cattle were on the allotment – for an estimated total of 2,840 AUMs. The 1959 range analysis data supported 1,185 AUMs. Cattle numbers were reduced in 1964 to 193 head of cattle and 1,281 AUMs, and reductions since then resulted in today's permitted numbers (144 cattle and 936 AUMs).

As with other Forest allotments, initially no fences existed and cattle distribution and use was attempted by riding and salting. Frequent accidents occurred on Highway 16 and 89 due to cattle/vehicle collisions. Extensive numbers of fences and water developments were planned in the 1965 AMP, and many implemented in the past 44 years. These improvements allowed the development of multiple pastures to achieve deferred rotation grazing. Due to the logistics of moving one combined herd of livestock and lack of water, today's two permittees continued to run separate herds.

The 1965 AMP also desired to shift the predominantly Kentucky bluegrass meadows to a range of native grasses such as green needle and thread grass, little bluestem, and sedges. The AMP noted compaction of primary grazing areas were the culprit for lack of diversity and less numbers would alleviate soil injury. Another positive change was turn out on to the allotment was postponed to June 1 from May 15. Another comment was made regarding the Norbeck Wildlife Preserve: "There are approximately 900 acres of range within this preserve. At the present time there is no competition for forage between range cattle and wildlife. In the future, if forage becomes a critical factor in the wildlife management, it would be necessary to reduce cattle use in this area in accordance with wildlife food needs. "

In the 1980s, several new AMPs were being developed, and portions of this allotment were re-assigned to another allotment on the west side of Highway 16/385 south of Hill City. This reduced the number of permittees to two ranchers who, by their own requests, continued to graze separate herds of cattle due to concerns about disrupting the purebred genetics of each respective herd. The date of the last AMP is December, 1988.

The north half of the Palmer Gulch Allotment contains roughly 4,853 acres of which about 1,100 acres are capable of supporting livestock grazing. It is managed as five pastures with deferred rotation of grazing use from June 1(depending on range readiness) to October 31 each year. There are 74 mature cattle (cow with calf) owned by one permittee. Maximum AUMs is 491 under current ten year term grazing permit. Over 340 acres of the south end of the Ford Pasture is within the Norbeck Wildlife Preserve, and is presently mostly unused by livestock due to dense pine vegetation reducing forage growth. Approximately 35 acres are designated as big game winter

range – primarily within Samalias Pasture. Livestock are moved to the next pasture when allowable proper use of 50% by weight is reached. The Sawmill Pasture is not being grazed due to lack of private landline fencing, and serves only as a trailing route to and from the Dump Pasture. The Dump Pasture is bisected by a privately owned railroad line, and there is a lack of cattleguards on the tracks so livestock grazing has not been occurring in recent years. The remaining three pastures (Ford, Keystone, and Samalias) are usually used at different times each year. Water can be limited in supply in the Ford Pasture later in the season. Limited water sources are found in the Keystone Pasture, while more dependable and distributed seeps and springs are found in the Samalias Pasture. The north half of this allotment is believed to be overstocked by approximately 14% of the permitted livestock numbers (about 10 mature cattle) based on capability grazing modeling. This area is characterized by limited and scattered riparian sites.

The south half of Palmer Gulch Allotment contains about 9,327 acres of which roughly 1,500 acres are capable of supporting livestock grazing. Six pastures are managed by adjusting period of use with deferred rotation. The current permitted use is 67 mature cattle (cow/calf) from June 1(depending on range readiness) to October 21. An allowance was made in the late 1990's for termination of a special use permit for grazing directly adjacent to the main ranch property, and another pasture (Summit) for winter on/off use was established from October 22 to May 31 for up to 3 mature cattle (cow/calf). This winter on/off use was permitted to allow the permittee time to re-locate fences back on the private/National Forest property boundary. All pastures are grazed by cattle owned by one permittee. Maximum AUMs is 416 under current ten year term grazing permit. All pastures have water sources or access to flowing streams but in drought years the permittee has hauled water. Over 1,600 acres is within the Norbeck Wildlife Preserve on the Rabbit, Palmer, and Sunday Pastures. Each pasture's portion within Norbeck is characterized by dense stands of pine, and pine encroachment into meadows and aspen. Livestock are moved to the next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. The south half of this allotment is believed to be under stocked by approximately 12% of the permitted livestock number based on capability grazing modeling, but there are needs to continue alleviating riparian resource concerns and providing any additional forage for Norbeck wildlife use. Several segments of streams or sites of riparian vegetation exist in this southern half of the allotment.

The allotment's upland sites have been monitored for utilization eight of the last ten years. The ten year allotment average for utilization is approximately 46%. In general, pasture use has been within prescribed limits although some instances of exceeding allowable proper use were recorded in 2007 for the Keystone, Lower Bear, Rabbit, and Upper Bear Pastures. Rabbit Pasture also exceeded desired levels of use in 2005. Recent field reviews have found the upland plant communities mostly dominated by non-native grasses such as Kentucky bluegrass, smooth brome, and timothy. A wide variety of forbs are present, as well as Western snowberry and wild rose species. Unlike past timber sales which emphasized pine regeneration, on-going timber sales outside of Norbeck Preserve have been cutting to a 40 to 50 basal area to reduce the potential for crown fires and mountain pine beetle outbreaks, and this approach has encouraged new grass, forb, and shrub growth. Some locations are expected to show an increase in Canada thistle infestations after sale activity is completed based on past experience.

The condition and trend in the north half of the allotment is represented by upland transect site Keystone #2, and has been rated by the ID Team as "Moving towards Desired Conditions". The

ID Team felt the reduced level of livestock use in recent years by permittee request of non-use for personal convenience, or in response to lack of water (drought), has allowed the north half's upland vegetation to improve even though capability modeling projects an overstocked situation. The presence of scattered noxious weed infestations and the minimal amount of native grasses in the meadow resulted in the lesser rating of desired conditions. Transect is dominated by Kentucky bluegrass and timothy. Bare ground percentage is within limits. While the native grasses do not dominate in the plant community, they are present within newly harvested timber sites. Effective ground cover to maintain soil stability and support wildlife habitat is present. The ID Team felt these conclusions would also apply to the Ford, Dump, and Samalias upland vegetation, as well.

Riparian areas in the north half are limited to two small stretches of Spring Creek in the Samalias Pasture, a short segment of Battle Creek, and scattered seep locations. They are rated by a 2008 PFC survey as at "Proper Functioning Condition" by the ID Team. However, there are concerns with unrestricted livestock access and the effect on Spring Creek in relation to meeting Total Maximum Daily Load (TMDL) objectives (see hydrology report), and for protection of these limited seep sources from trampling. There is also a small headcut occurring in Battle Creek from a defunct effort to tap water into a stock tank or pond.

The condition and trend in the south half of the allotment is represented by upland transect site Rabbit #3, and has been rated as "Not Meeting Desired Conditions." The presence of Canada thistle infestations, the minimal amount of native grasses in the meadow and the presence of fringed sage in higher than expected levels resulted in the lesser rating of desired conditions. The ID Team did note that since the days of use in the pasture were reduced in 2005 and weed spraying has been started, the area has fewer weeds and more grass plants. Abundant weed seed is present as any exposed soil from burrowing animals is quickly vegetated with thistles. Ground cover to maintain soil stability is improving but bare ground is still visually present. Other pastures in this allotment "Moving Towards Desired Conditions" were Lower Bear, Sunday, and East Zimmer based on field observations and comparing with the Rabbit Pasture's condition and trend.

Riparian sites in the south half of the allotment were assessed in 2008 by the ID Team. Palmer Creek within the Palmer Pasture was rated with a PFC assessment of "Functional – At Risk" condition with no apparent trend. The factors contributing to this rating were a deeply incised channel that is still subject to erosion. Another PFC assessment at the same time was made in Rabbit Gulch of the Rabbit Pasture with a rating of "Functional at Risk" with no apparent trend. There are concerns with the lack of riparian vegetation along an intermittent channel and the area has not achieved its potential extent.

Concerns regarding the condition and trend of the riparian areas found in Upper Bear Pasture led to the establishment of a Designated Monitoring Area (DMA) with a MIMS transect to document baseline conditions, and compare results against desired threshold levels. Upper Bear DMA#6 shows Kentucky bluegrass as the dominant vegetation but some riparian species are also present. The desired percent of hydric plants is below the threshold level (53% versus 80%). Streambank stability exceeds desired level, but alteration ratings exceed threshold level. DMA #6 was rated as "Moving towards Desired Conditions". The chief cause of DMA#6's present rating not being at Desired Conditions is because the length of time that this pasture is grazed (45 days) which allows for repeated use of regrowth and opportunities for streambank alteration by hoof impact. Similar

conditions exist within the Palmer Pasture with regards to streambank condition and presence of hydric vegetation because of field observations and the reduced level of use by livestock (21 days).

Range improvements (north half) have been maintained or reconstructed, but some fences are deteriorating from age – particularly those along the Highway 16. The permittee's base property adjoins the Keystone Pasture, so trailing to and from the permitted area is easily accomplished. Range improvements (south half) have been maintained or reconstructed, but some fences are in poor shape – particularly those along the southwest side of the Palmer Pasture. The permittee does have a ranch manager who is tasked with performing improvement maintenance. The base property for the permittee lies directly adjacent to the Rabbit Pasture so livestock are trailed to and from the permitted area. There are a total of three spring developments, 18 ponds, one water tank, and over 27 miles of fencing spread over the entire allotment.

In the north half of the allotment, there is a pond in the Dump Pasture that is too shallow. Two other ponds in the Ford Pasture are vegetated and have reduced water holding capacity. Livestock can access the Twin Springs Road, the Black Hills Railroad line, and the Old Hill City Highway from the Keystone Pasture, and seek water from Palmer Creek within the county road ROW. Additionally, the Centennial Trail lacks fencing and a trail gate so livestock cross the road, as well. A spring in the southern portion of the Keystone Pasture needs protection from trampling by livestock and big game. There is a segment of unused fencing in the northeast portion of the Keystone Pasture and another stretch in the Sawmill Pasture is unused. In the Samalias Pasture, two ponds have reduced capacity to hold run-off precipitation, and the Joe Dollar water development's pipeline and headbox are not functioning correctly. There are several riparian areas within the Samalias Pasture that are trampled by livestock, and two access points to Spring Creek allow livestock full access to the stream.

In the south half of the allotment, fencing around an old Forest Service administrative horse pasture is not used. The spring source in the East Zimmer Pasture is trampled by livestock and big game. A temporary water tank is used in drought years in the Lower Bear Pasture, and its current location is too close to a riparian area. A fence in northwestern portion of the Lower Bear Pasture is not long enough to contain drifting livestock. In the Rabbit Pasture, the "Fender Place" pond is breeched and has reduced water holding capacity, and livestock are trampling the spring sources. The Summit Pasture's perimeter fencing currently fences about 20 acres of National Forest into private land use. Existing pasture boundary fencing in Upper Bear and Lower Bear Pastures on the east side of each does not include two large tracts of primary and secondary rangeland.

Porcupine Allotment

The Porcupine Allotment is roughly the shape of a rectangle – six miles long on the north-south axis by four miles wide going east-west. It is about 10 miles west/northwest of Custer, South Dakota. It covers 9,858 acres. Approximately 8,900 acres are considered capable of producing useable forage for livestock grazing. Over 95% of these forage producing acres are located in grasslands and non-stocked ponderosa pine stands.

Over 50 years ago, this allotment was grazed by permitted sheep (Porcupine #2) and cattle (Porcupine #1). A total of 980 ewes plus lambs were grazed from mid-June to mid-September each year. Another 40 plus cow/calf pairs were grazed at the same time as the sheep. Some special use permits allowed another 20 pair to graze from mid-May to the end of October. Most

of the adjacent allotments in the vicinity also had permitted sheep, and some efforts were planned to construct sheep fencing between allotments. There is some note of the need for sheep and cattle ranchers to cooperate in management.

In 1969, both permits were acquired by one permittee, and the areas combined and called the Porcupine Allotment. The 1970 Multiple Use Survey states 182 mature cattle (cow/calf) and 391 sheep would graze this allotment by combining private lands (Cooper Ranch) with National Forest. Roughly one half of the allotment's combined acreage of 9,263 acres was rated as suitable for grazing, and the author noted water was limiting, deer migrated to lower elevation during the winter, and anticipated timber regeneration after harvest activities would have to be evaluated for effects of grazing on young seedlings. Grazing was planned to be a four pasture deferred rotation including the private Cooper Ranch as one of the pastures. Grazing capacity was estimated at 905 AUMs.

An aggressive range improvement plan was intended with permittee cooperation and cost sharing for 6.5 miles of fence, 22 stock ponds, one cattleguard, and four water developments. The permittee also drilled a deep well and started piping water into the allotment from private property. Key plant species for range monitoring were to be *Poa* species and western wheatgrass. In 1971, the permittee converted to strictly cattle because of sheep losses due to predators. Plans were made to spray snowberry pockets with chemicals to eliminate their presence and increase forage production. The permittee ran mostly yearlings from 1971 to 1985, eventually increasing their number to 374 yearlings or equivalent to 960 AUMs as shown on the term permit. Capacity increases were tested by use of temporary permits and followed capital investments being completed by the permittee.

The permittee became interested in Holistic Resource Management (HRM) in 1986, and began discussions with the Forest Service on how to best implement this approach. Both the permittee and Forest Service personnel completed HRM training, the Forest Service approved using HRM in 1989, and a management team was formed. Today's primary members consist of the Forest Service range staff, the permittee, the South Dakota Game, Fish, and Parks, the Sierra Club, and South Dakota State University. In 2009, additional secondary members were added from Forest Service's wildlife, botany, and hydrology programs. In 1990, the permittee began grazing cow/calf pairs in lieu of yearlings, and in 1991, the term grazing permit was revised to reflect a variable numbers, variable season approach as specified in the biological plan (known then as the Annual Operating Plan). Average use was projected as equivalent to 334 head for a three month and 22 day period of use.

The Porcupine Allotment continues under Holistic Management (HM) using a 12 pasture planned grazing with progress directed by an interdisciplinary team. The team members meet at least twice a year to review allotment progress and plan annual use numbers, specific treatment objectives, and consider any new range improvements or reconstruction project proposals. Livestock are grazed from approximately June 9 (depending on range readiness) through September 30, with an average use of 334 cattle (cow/calf with some yearlings) owned by one permittee (variable numbers and season allowed each year by this permit). The average number of AUMs is 1,652 under a ten year term grazing. The southern 1/3 of the allotment (over 3,400 acres) is classified as big game winter range. For all pastures, all livestock are moved to next pasture when allowable proper use is approximately 50% and vegetative, soil, and biological management objectives are met. The allotment is believed to be under stocked by approximately 45% of permitted livestock numbers based on capability grazing modeling because of 2000 Jasper fire affects created additional primary

rangelands. The HRM Team and the Forest Service agrees that to handle livestock grazing use in moderate drought conditions the most likely change would be to adjust season of use. Well sources seem dependable and adequate water may not be an issue.

The southern third of the allotment tends to face more to the south and is noted by Cooper Ridge its northern extent. The northern two thirds is a series of rolling hills that drain into Upper Gillette Canyon, Wildcat Gulch, Wolf Canyon, or West Hells Canyon. Signal Hill is located in the southeastern portion of the allotment and is of historical significance. Several springs provide some watering sources for livestock and wildlife: North Antelope, Wells Spring, Seep Spring, and Wildcat Spring. These limited supplies are supplemented by wells found on Cooper Ranch (Game Production Area – South Dakota Game, Fish, and Parks). A series of pipelines and pumps interconnect these wells and allow for movement of water as needs through several water storage tanks. The terrain is fairly open after the 2000 Jasper Fire; most of the surviving pine stands are located on the east third of the allotment although some isolated pockets exist around the Custer Limestone Road corridor. The present overall vista of the area shows extensive pockets of snags in various stages of decay from the 2000 fire, and considerable downed slash which obstruct livestock and big game use to varying degrees. Considerable regrowth after the fire consisting of grasses, forbs, aspen re-sprouts, and some shrubs are readily apparent. Several recorded montane grassland sites are within the allotment. They are Upper Gillette Canyon, West Hells Canyon, and Middle Gillette Canyon. Most sites were rated moderately to heavily altered by past use while in private ownership since most locations were found within old homesteads that are now owned by the National Forest. The Upper Gillette Canyon site is the most extensive and in the best condition (Marriott, 2000).

The allotment's upland sites have been monitored for utilization seven of the last ten years. The ten year allotment average for utilization is approximately 38%. In general, pasture use has been within prescribed limits and meeting resource objectives set by the HRM Team. A third party assessment was conducted in 2008 and addressed allotment status from a Holistic Management point of view, evaluating the water cycle, mineral cycle, community dynamics, and energy flow (Kroos, 2008). The water cycle was rated as excellent, with no visible signs of soil erosion. The evaluator found the mineral cycle functioning moderately well on two thirds of the pastures, and plant material (predominately herbaceous litter) building up and accumulating to some degree on the remaining third of the pastures (Babbington, West Hells Canyon 1, West Hells Canyon 2, Signal, and South Exchange). This build-up suppresses production of plants, seems to favor more noxious weeds, and reduced energy flow. Community dynamics were rated as excellent because plant diversity is good (native and non-native grasses are present), signs of small game, insects, and upland birds were noted or species observed, and a large herd of elk was seen using the pastures. Plant regeneration after the 2000 wildfire is very good except in areas where plant material (thatch) is building up and suppressing new growth. Energy flow is discussed in terms of the ability of the site to capture sunshine through green plants, and for this flow to function properly the water and mineral cycle must be operating properly, and community dynamics be in balance. The energy flow is rated as functionally well except for areas where thatch is building up.

The condition and trend in a majority of the allotment is represented by upland transect sites at Babbington #2, Signal #3, and Antelope #1. The former is rated as "Meeting Desired Conditions," and the latter two rated as "Moving towards Desired Conditions" respectively. There are some concerns about the amount of bare ground scattered throughout the allotment (and created by the high intensity fire), but no visible erosion or dust has been noted, and progress towards less bare

soil noted since 2005 (from about 8% allotment-wide to 3% as of 2009). Signal #2 had some concerns regarding the amount of noxious weeds present in 2005, but their presence in 2009 is markedly reduced. Allotment-wise, there is a large amount of dead and downed woody debris from the decaying pine which is accumulating on the soil surface and obstructing animal access and new plan growth, particularly in the western two thirds of the allotment.

There is one other upland transect site located in the Yount Pasture. This pasture is only 233 acres in size, and was formerly in private ownership. The Forest Service acquired this tract in the 1980s, and has been attempting to restore it. While in private ownership, this parcel was subjected to year-round use by livestock. Prescribed use after acquisition has been limited and under deferred rotation management. Site production is noticeably less than surrounding pastures despite being primarily meadowland. Forage production is reduced and plant diversity is depleted but has recovered somewhat in 2009 following complete rest. This pasture's transect is labeled Yount #2 and is rated as "Not meeting Desired Conditions."

There are no riparian transects or PFC assessments on this allotment, because there are no flowing streams or significant riparian locations. The four small riparian areas associated with spring sources are generally fenced off from livestock use.

Range improvements have been maintained and are in relatively good condition despite age throughout the allotment. The allotment has a history of extensive investments in fencing, water developments, storage tanks, wells, pipelines, and stock dams. There are three vertical wells, five spring developments, 19 ponds, 18 water tanks, three storage tanks, approximately nine miles of water transfer pipeline, and over 34 miles of fencing (permanent and electric). The permittee rides this allotment multiple times each week, and stays in a leased cabin. He uses a combination of mechanized and horseback methods to maintain this allotment, distribute salt, and move livestock on a fast rotation of pasture use. Some fencing is electric while others are permanent. Attention is paid to wire heights and tension to avoid impeding big game. The permittee in the past leased Cooper Ranch including use of associated corrals, cabin, and well for administration of the Porcupine Allotment. Cooper Ranch has been recently purchased by the South Dakota Game, Fish, and Parks Department, is managed as a Game Production Area, and the permittee again has lease arrangements. Livestock are trucked to and from the leased ground, and then trailed on to the permitted area.

The Babbington-North Wolf #1 and Wildcat-North Wolf #1 pasture boundary is unfenced. Wildcat-North Wolf 1 Pasture does not have an exclusive water development for livestock and big game. The Seeps Springs, Wells Cabin Spring, and North Antelope Spring exclosures are small and livestock and big game trample the riparian areas. Slash loading from the Jasper Fire impede animal access to forage and browse. Pine encroachment would eventually reduce forage and browse production for livestock and big game, but perhaps restore some of the winter range characteristics. Pipelines are mostly on the surface and need to be buried for protection from equipment and fire.

Redfern Allotment

The Redfern Allotment covers 11,573 acres in the central part of the Black Hills. It is approximately six miles northwest of Hill City, South Dakota. It is bordered by the China Gulch Road on the east, the Tigerville Allotment on the south which included Burnt Fork and the community of Tigerville, the Mystic County Road on the west, and old Mystic town site on the

north including the Mickelson Trailhead. Major drainages include Slate Creek and White Earth tributary, Spruce Gulch, Spaw Gulch (Flannigan's Cabin area), and Nugget Gulch, all of which tend to flow to the north. The allotment is approximately six miles long going north-south and five miles width going east-west. The terrain is characterized by meadows of varying widths supported by steep and sometimes rocky slopes of Ponderosa Pine, much of which was planted after the 1939 McVey Fire. These pines originated from Colorado Front Range seed stock, and tend to produce a brushy canopy that shades out undergrowth vegetation. Conifer encroachment into grazeable land is apparent. Much of the allotment is thickly stocked with conifers.

Allotment records of historic use are summarized in a 1970 AMP. Records for actual use data prior to 1947 were not found, but correspondence indicated that up to 2,900 AUMs were grazed plus considerable trespass by horses and other non-permitted livestock from 1905-1949. Given today's permitted period of use, that would be equivalent to 490 mature cattle (cow/calf pairs) versus today's 195 pairs. During the 1940s, at least nine permittees used the allotment, and the record states none were very interested in improving management and allotment conditions. Cattle entered the Forest in May, and each permittee attempted to keep them in their own sub-allotment. Use was reduced by the Forest Service in 1951 to approximately 1,045 AUMs versus today's current permitted use of 1,159 AUMs. A few additional special use permits or private land permits held by the permittees were apparently eventually converted to term permits hence the increase in AUMs.

Starting in 1969, the remaining permittee entered into a five year development program with the Forest Service. A cost-share program created pastures by constructing fences, installed water developments, dug ponds, and sprayed snowberry – with the end result being today's pasture configuration of four main pastures. Capacity in 1970 was estimated at 2,200 AUMs, but a decision was made to retain present numbers (219 pairs for about 1,200 AUMs) and not increase use to avoid overuse of the primary rangelands. A fifth pasture, Dutchman was added to the existing four and a five pasture rest rotation system was used for several years.

Eventually, this was changed back to a four pasture rotation as the Dutchman Pasture became its own separate allotment around 1980. In 1992, an AMP revision was developed which continued the present management emphasis and deferred rotation. It called for multiple objectives such as: 1) sustain livestock grazing to the capacity made available by high investment in improvements; manage forest to provide an increase in wildlife habitat; 2) resolve conflicts in favor of wildlife; 3) maintain aspen diversity; 4) fence off camping units along Slate Creek Dam; 5) set proper use at 45% for livestock by weight; and 6) maintain vegetative diversity and condition in Slate Creek by continuing deferred grazing at low stocking level. The only range improvements authorized were constructing allotment boundary fencing between the Nugget Pasture and the former Pactola Ranger District to the east; some of this work was completed. Prescribed burning has occurred in some pastures for fuels and wildlife treatment objectives. Slate Creek Dam has not been fenced off nor has proper use been set at 45% by weight. There was no data located to document the condition of the riparian area in Slate Creek in 1992.

The Redfern Allotment is currently managed as a four pasture deferred rotation sequence of use with one small, separate round-up pasture used each fall for several days. Livestock grazed from June 11 (depending on range readiness) to October are 195 mature cattle (cow/calf) owned by one permittee. The permittee usually does not bring the herd up until June 17 each year, and sometimes removes cattle earlier than paid for due to concerns regarding fall weather storms.

For the past ten years the permittee has applied for non-use for resource protection due to low forage production and lack of water during the drought. This non-use has ranged 18 to 95 pairs in the last five years. The average AUMs is 1,159 under a ten year term grazing. Virtually the entire allotment is classified as big game winter range. Livestock are moved to the next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. A recent permit waiver based on sale of 177 mature cattle of the total permitted number of 195 cattle is being finalized. The Forest Service would be retaining the remaining 18 head in non-use status because of resource protection needs and also because the minimum term grazing permit size is 25 head. Approximately 2,659 acres are considered capable of producing useable forage for livestock grazing. Over 80% of the forage producing acres are located in conifer, hardwoods, and non-stocked ponderosa pine locations. The allotment is believed to be overstocked by approximately 28% of the current permitted livestock numbers (about 60 mature cattle) based on capability grazing modeling. The overstocking is possibly because the replanted conifers have encroached and continue to reduce forage production after the 1939 McVey Fire.

A portion of this area is within the Slate Castle Project area and vegetative treatments are planned but their effect on forage and browse production is uncertain, at this time. All pastures contain some scattered aspen or birch. Slate Creek has been altered by road construction and previous grazing use, and lacks riparian vegetation and sustainable stream flows, particularly during drought years. Allotment –wide, the lack of water can be an issue during drought years. Slate Creek, Spruce Gulch, and West Nugget Gulch can flow water to varying amounts and durations depending on the precipitation; other locations rely on water storage in developed ponds or old beaver dams. The ID Team believes that to handle livestock grazing use in moderate drought conditions some adjustments in season of use and numbers may be necessary. Some team members have suggested supplemental water hauling as an option.

The allotment's upland sites have been monitored for utilization six of the last ten years. The ten year allotment average for utilization is approximately 47%, but average use in 2007 and 2009 was 66% and 57% respectively despite less numbers grazed. Past field reviews found a wide variety of grasses and forbs in this allotment, with the grass component dominated by *Poa* species and timothy. Sedges are also found, as well as snowberry. Smooth brome is not as dominant as it appears in other allotments. Bare ground has not been an issue, but Canada thistle and Leafy spurge are present throughout the pastures in varying densities. The north end of the Slate Creek Pasture does not receive as much use due to lack of available water.

The condition and trend of this allotment is represented by upland transect site White Earth #1. There is a diverse mix of grasses and forbs with some snowberry, but Canada thistle is present and native grasses are not dominant. Bare ground is not a concern. The ID Team rated the uplands in the allotment as "Not Meeting Desired Conditions" because of an increase in noxious weed infestations and past levels of overutilization is affecting plant vitality. There were some concerns by the ID Team that allocated forage for wintering wildlife is being compromised by overuse of primary rangelands.

Riparian sites in this allotment were assessed in 2008. Spruce Gulch within the Queen Bee Pasture was rated with a PFC assessment as "Functional – At Risk" condition with downward trend. The factors contributing to this rating were a deep, incised channel that is still subject to

erosion, shearing of streambanks, and the presence of a nearby road in some locations that confines the stream's meanders. There are concerns that the duration of grazing (45 days) was contributing to livestock impacts to the creek.

Since concerns regarding the condition and trend of the riparian areas were found in Slate Creek Pasture, a Designated Monitoring Area (DMA) was established with a MIMS transect to document baseline conditions, and compare results against desired threshold levels. Slate Creek DMA#3 shows Kentucky bluegrass as the dominant vegetation but some riparian species are also present. The desired percent of hydric plants is below the threshold level (53% versus 80%). Streambank stability exceeds desired level, but alteration ratings exceed threshold level. DMA #3 was rated as "Moving towards Desired Conditions". The chief cause of DMA#3's present rating not being at Desired Conditions is believed to be the length of time that this pasture is grazed (36 days) which allows for repeated use of regrowth and opportunities for streambank alteration by hoof impact. There are also several segments of this channel which ran dry during the drought years.

Range improvements have been maintained and are in relatively good condition despite age throughout the allotment, with some exceptions regarding two water developments in the Slate Pasture and one in the Queen Bee Pasture. There are six spring developments, 26 ponds, three water tanks, and over 18 miles of fencing. The permittee's rider has been actively maintaining all fences. In recent years, the permittee updated the corral/loading area along the Mystic County Road which is located on NFS land.

The lone water development in the Queen Bee Pasture is defunct, and is directly adjacent to Spruce Gulch's riparian areas. The permittee's administrative horse pasture is in need of reconstruction or removal; the scope and standard for use needs clarification. The Redfern Holding Pasture is too small to hold 195 pairs for more than two days. Both water developments in upper Slate Pasture do not work as designed and no water is available.

Rimmer Allotment

The Rimmer Allotment is located approximately eight miles northwest of Hill City, SD. It is found on the north edge of Slate Prairie and extends northerly towards Castle Creek drainage. A total of 2,011 acres of NFS lands make up the allotment. The allotment is approximately three and one-half miles long on its north-south alignment and just less than two miles wide on its east-west axis. It is roughly bordered by the Slate Prairie Road on the southwest, Castle Creek on the northwest, and an unnamed ridgeline on the east that tiers into the intermittent headwaters of Bittersweet Creek found in the southeast corner of the Rimmer Allotment. Notable features within the north half of this allotment includes a rugged canyon segment which includes Castle Creek, and two narrow drainages which each contain an unnamed creek. Much of the north half of this allotment is forested with Ponderosa Pine or pine/spruce/aspen mix on north slopes. Recent timber sale activities have substantially opened up the understory vegetation to more direct sunlight. Some riparian vegetation is found within spruce and aspen trees along the creeks. The south half of the allotment is more open and is characterized by open vistas and prairie grassland vegetation. Panoramic views of Harney Peak and Reynolds Prairie are noted from the highest windswept ridges. Approximately 200 acres of T1N R3E S15 and S22 are classified as a montane grassland site (Marriott, 2000). The timbered area of this allotment does not appear to have been burned in the 1939 McVey wildfire.

An AMP written in 1965 provided a brief history of past use dating back to 1952. Prior to that point this allotment was part of the Slate Prairie Allotment and subjected to use by permitted cattle and perhaps trespass livestock including horses. A large private in-holding against the allotment had special use pastures between it and the National Forest lands. In 1951, the Forest Service reduced permitted use on the Rimmer Allotment from 32 cow/calf pairs to 18 pairs. File correspondence indicates the reduction took place during waiver transaction in the late 1950s. Private grazing land was fenced in or managed with the National Forest. Authorized numbers increased to 26 pairs in the mid-1960s, and then eventually to 33 pairs still permitted today. The 1965 AMP estimated grazing carrying capacity for livestock at 340 AUMs by grazing 919 acres in contrast to the present permitted numbers of 175 AUMs. The last AMP was approved in 1991, and capacity was estimated at 245 AUMs over 919 acres. In 2009, approximately 545 acres are considered capable of producing useable forage for livestock grazing. Over 62% of these forage producing acres are located conifer, hardwoods, and non-stocked pine ponderosa locations.

Some objectives from the 1991 AMP included: 1) implementing a three pasture rest rotation grazing system; 2) provide 175 AUMs of livestock forage with capability of the land resource and without impairing productivity or creating unacceptable conflicts; 3) maintain moderate conditions of riparian resources; 4) allocate forage for big game; 5) continue noxious weed control; 6) construct two new ponds and build fencing to create a third pasture; 7) salt and use protein supplements at least 400 yards from any water source and do not salt in meadows, bottoms, or within in site of roads or trails; 8) proper allowable use is set at 45%; and 9) rest one pasture each year after third pasture improvements are completed. The three pasture rest rotation was never implemented because the fencing was not built. Present AUMs remain unchanged from the 1991 plan. Riparian resources are considered as not meeting desired conditions as later in this section. Forage continues to be allocated for big game except overutilization by livestock competes with wildlife use. Weeds are still being controlled. Some salting meets objectives while other block placement is not to specification. No pasture is rested from livestock grazing use.

The Rimmer Allotment is currently managed as a two pasture deferred rotation sequence of use, from June 11 (depending on range readiness) to October 10 for 33 mature cattle (cow/calf) owned by one permittee. Average AUMs is 175 under a ten year term grazing. The entire allotment is not classified as big game winter range. Livestock are moved to next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. In recent years the permittee has been removing livestock early from the allotment between October 1 and October 10. Allotment is projected by capability grazing modeling to be under stocked by approximately 6% of the permitted livestock numbers (about 2 mature cattle), but there have been recent, extensive timber sales which have significantly increased canopy openings in conifers. For the past several years, an additional 20 pair of cattle have been grazed to test the capacity of this allotment. The results from utilization studies show grazing use has been in excess of the proper allowable use by weight percentage (50%). The 20 head were from another allotment; the trial use of the Rimmer Allotment afforded a temporary reduction in grazing numbers on the Slate Prairie Allotment.

The allotment's upland sites have been monitored for utilization six of the last ten years. The ten year allotment average for utilization is approximately 51%, but average use during the trial period of 20 additional cattle pairs in 2008 and 2009 was 55%. The Rimmer Pasture is grazed approximately 82 straight days per year, and that provides opportunities for plant regrowth to be

grazed again in the same season. Past field reviews found a wide variety of grasses and forbs in this allotment, with the grass component dominated by Kentucky bluegrass and smooth brome in the north half of the allotment, while the south half of the allotment is more diverse grass species wise – which matches up with the montane grassland assessment. In the south half, there are more native grass species, upland sedges are more apparent, and a greater diversity of forbs is present. Bare ground and noxious weed infestations are not an issue, but timber landings and skid trails would need to be monitored for an increase in Canada thistle.

The condition and trend of upland vegetation is represented by transects at Rimmer #2 (south half of allotment) and Rimmer #3 (north half of allotment). The ID Team rated Rimmer #2 and Rimmer #3 as "Not Meeting Desired Conditions" because some grazed areas are exceeding proper allowable use, which causes bare ground percentages to exceed threshold levels. There appears to be a trend towards more bare ground than in the past. Both study sites are found in the Rimmer Pasture, and the duration of grazing use is long. Plant regrowth is subjected to repeated grazing use which compact soils and reduces plant vitality. There is also white sage, green sagewort, and fringed sage present in greater numbers around Rimmer #2 than expected, but this is believed to be a relic condition from when season-long use was occurring with increased numbers of livestock – both authorized and trespass. However, long duration grazing can promote these existing sage species. Condition and trend for upland vegetation in the Grandad Pasture was rated as "Meeting Desired Conditions". It appears that livestock are spending considerable time on adjacent private lands in addition to this pasture, hence lessening the impact to the Grandad Pasture.

Water is lacking on the south end of this allotment except when ponds fill with rainfall or Bittersweet Creek has surface flows. The two unnamed streams and seeps in the north half provide a majority of the watering needs for livestock and big game. Riparian sites in this allotment were assessed in 2008. Bittersweet Creek headwaters within the Rimmer Pasture were rated with a PFC assessment as "Functional – At Risk" condition with downward trend. The factors contributing were breeched beaver dams, a riparian area that has not reached its full potential, portions of stream are completely degraded and have no water flow, and willows lack recruitment of younger age classes. Castle Creek segment within Grandad Pasture is rated as "Proper Functioning Condition" with upward trend. There are some issues with channel sinuosity and lack of sediment to build banks, but the causes are beyond the control of the permittee since another agency regulates flow releases from Deerfield Dam. Another PFC assessment was completed for "CC1B" (unnamed creek) and rated as "Functional – At Risk" with downward trend. Some of the factors contributing to this rating were the lack of willows, the presence of snowberry and upland grass plants directly adjacent to channel where riparian vegetation should be instead, lots of hoof action degrading streambanks, and no coarse woody material to dissipate storm event flows.

Since concerns regarding the condition and trend of the riparian areas were found in Rimmer Pasture by the PFC assessment, a Designated Monitoring Area (DMA) with a MIMS transect to document baseline conditions and compare results against desired threshold levels was established. CC1B DMA #5 (north half of Rimmer Pasture) shows Kentucky bluegrass is dominant; riparian vegetation is very limited in presence. The DMA #5 was rated as "Not meeting Desired Conditions". Streambank stability rating meets threshold level. Streambank alteration exceeds threshold level. The percent of hydric plants is only 21% and the threshold is greater than or equal to 80%. The duration of use is the root cause for the condition and trend of the riparian vegetation

in this pasture. The soils of this area seem to help stabilize the stream channel despite heavy livestock use.

Range improvements have been maintained and are in relatively good condition throughout the allotment, although they are approaching 40 years of age and some deterioration is occurring. There is one spring development, two ponds, and over five miles of fencing. The permittee has used a range rider with varying degrees of success over the past several years. Salt placement has been in compliance at times, and in some instances too close to water sources. The permittee owns a corral and holding pasture in close proximity to this allotment along the old Hill City Road.

Trail 40 gates are left open and livestock can leave or enter the allotment. The spring exclosure at Lost Park Spring is down and livestock and big game are trampling the source and associated riparian area. Recent timber sale activities have opened up vegetative barriers and livestock may drift off allotment.

Slate Prairie Allotment

The Slate Prairie Allotment is approximately 5,896 acres and lies about six miles northwest of Hill City, SD. It ranges from Slate Prairie to the west, Bittersweet and Castle Creek on the north, the Mystic County Road on the east, and the old McVey Road on the south. It is six miles wide on an east-west aspect, and four miles long on the north-south access. The area is characterized by meadows of varying widths and dense pine stands on slopes. The terrain is best described as a series of rolling hills bisected by three draws on a southwest to northeast alignment – Crooked Creek, Whitetail Gulch, and Daugherty Gulch. The terrain to the north is relatively unfenced as steep, pine/spruce obstructed draws limit livestock spread into Castle Creek.

Most of this allotment was burned in the 1939 McVey wildfire and was extensively planted with pines originated from Colorado Front Range seed stock. These pines tend to produce a brushy canopy that shades out undergrowth vegetation, and little tree thinning has been completed since planting. The planted tree stands are now tightly grouped and understory production is low on all aspects. Some remnants of pre-McVey pine exist in isolated locations, and they tend to be characterized by tall, widely spaced pines with grass and shrub understory. Scattered aspen and birch stands can be found, but their presence is greatly reduced by conifer encroachment.

After the 1939 fire, the terrain was very open and dominated by grass and forb growth, aspen regeneration, and fields of snags. Some post removal for fencing occurred, and most pine snags eventually fell over and decayed. Some exclosures were built to protect spring sources. Pine regeneration in burned over areas has actively progressed since 1939, and conifer encroachment into meadows, aspen stands as been an on-going process. The result is aspen stands and browse plants are diminished, and forage production from meadows and non-stocked pine and spruce stands is greatly reduced.

From 1905 to 1967, the Slate Prairie Allotment was subjected to on in the spring, off in the fall cattle management. Few fences were in existence, and riding and salting were the main distribution and control tools. According to the 1965 and 1970 AMPs, the allotment was actually broken up into six sub-allotments: Gold Run, Dutchman, Clinton, Slate Prairie, Bittersweet, and Rimmer; there were five permittees. In 1961, each of the sub-allotments was converted to individual allotments. The Slate Prairie Allotment was grazed by over 205 cattle

(yearlings and cow/calf pairs – term and temporary permits) plus special use pasture permits for an estimated 1,400 AUMs. File notes indicate analysis work completed in 1993 found this allotment fully stocked and use by weight at 34%. In 2009, approximately 1,971 acres are considered capable of producing useable forage for livestock grazing. Over 66% of these forage producing acres are located in conifer, hardwood, and non-stocked ponderosa pine locations.

In 1968, the permittees and Forest Service entered into an agreement to construct almost 12 miles of pasture and allotment boundary fencing and excavate five ponds. These fencing projects created five pastures. In 1969, temporary permits were converted to term, and the southern tip of the allotment (with 25 pair of cattle) was re-assigned to form the new Tigerville Allotment. This reduced the number of permittees to one and all special use permit pastures were also ended. The total permitted cattle numbers eventually adjusted to around 200 in the mid-1980s. Other projects of note in the 1970 AMP were soil pitting by mechanical means to reduce "sod-bound Bluegrass" and spraying over 370 acres to reduce snowberry concentrations. Special note was made to avoid spraying or drift into upper slopes where winter range browse was located. Spraying was to be completed by aircraft and ground rigs; map records indicate the project was completed by 1980; pitting work was in lower Daugherty Gulch and in the middle of Section 30 between Mystic and Hay Draw Pastures.

Another past record of note is a 1971 Multiple Use Survey Report's findings that discusses the use the McVey Winter Range receives in this area by big game, predominately whitetail deer at the time of the report. The report states a large number of deer migrate to the burn in December and January from the north and west. Competition for forage and browse between livestock and deer occurs when meadows are overgrazed by cattle and they move up on to the slopes in search of more grass, or even use browse. A five pasture rest rotation grazing system was envisioned to control grazing use and leave forage and browse for deer. Records show planned rotations from the late 1960s through the early 1980s using five pastures and always resting one of the five each season of use. Today five pastures exist but the Plantation Pasture is a part of the Mystic Pasture (southeast third near the Mystic County Road) and the Slate School Pasture was split into Slate School and West School Pastures.

The Slate Prairie Allotment is managed today as a five pasture deferred rotation sequence of use from June 1 (depending on range readiness) to October 20 for 200 mature cattle (cow/calf) owned by one permittee. Maximum AUMs is 1,232 under a ten year term grazing permit. Over 4,500 acres of this allotment is classified as big game winter range. Livestock are moved to next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. In recent years, the permittee has been removing livestock early from the allotment between October 1 and October 20. Allotment is projected by capability grazing modeling to be overstocked by approximately 15% of the permitted livestock numbers (about 20 mature cattle), but past measurements of grazing use suggest overstocking may be as large as 30% (60 mature cattle). The ID Team believes this overstocking situation is because the replanted conifers have encroached and continue to reduce forage production after the 1939 McVey Fire. It may be at some point forage underneath a closing conifer canopy becomes unpalatable for livestock due to needle cast influence on plant quality (Beckner, 2007). A portion of this area is within the approved Slate Castle Project Area and vegetative treatments are planned, but their effect on forage and browse production is uncertain at this time.

Water supplies within the allotment vary – generally spring and creek sources continue to flow water even in a drought, but constructed stock dams would be dry unless a summer thunderstorm event occurs. The Mystic Pasture relies on dams for water supplies, although a two small segments of Slate Creek to furnish livestock watering sites and some intermittent flows along the Mystic County Road. Hay Draw and Whitetail Pasture have a combination of springs, water tanks, and dams. Whitetail livestock also can access Crooked Creek. West School Pasture has a spring and water tank, and Slate School Pasture is watered by a pond with spillway. The ID Team believes that to handle livestock grazing use in moderate drought conditions some adjustments in season of use and numbers may be necessary, based on past results.

The allotment's upland sites have been monitored for utilization seven of the last ten years. The ten year allotment average for utilization is approximately 56%; average use during the trial period with 20 less cattle pairs in 2008 and 2009 was approximately 60%. Past field reviews found a wide variety of grasses and forbs in this allotment, with the grass component dominated by Kentucky bluegrass, smooth brome, and timothy in all pastures except Slate School. Bare ground and noxious weed infestations (Canada thistle and Leafy spurge) are an area of concern for the ID Team. In 2009, Leafy spurge was especially visible and the target of multiple biological releases in an attempt to control the spurge.

The condition and trend of upland vegetation is represented by transects at Mystic #2 and Whitetail #4 and rated both as "Not Meeting Desired Conditions" because of grazed areas are repeatedly exceeding proper allowable use, which is adversely affecting plant vitality and causing bare ground percentages to creep upward. In some areas, bare ground percentage is exceeding threshold levels or appears to be trending higher. As expressed for Redfern Allotment, there were also concerns that allocated forage for wintering wildlife is being compromised by overuse of primary rangelands.

Riparian sites in this allotment were assessed in 2008. The main pond in the Slate School Pasture and related channel downstream from the dam were rated with a PFC assessment as "Functional – At Risk" (pond) and "Nonfunctional" (downstream from pond) with downward trends. The factors contributing were the channel feeding the pond is incised and eroding, riparian plants present but in depleted numbers and heavily impacted by trampling, and the spillway is eroding. This site serves as the sole watering source for the east two thirds of this pasture. Another PFC assessment was completed in Crooked Creek; this site flows water and is altered by the placement of the road and culverts. Crooked Creek was rated as "Functional – At Risk" with no apparent trend. The riparian area has not reached its full extent, areas adjacent to creek have hummocks, and Crooked Creek has not reached a balance of sinuosity, width/depth ratio, and gradient. Daugherty Gulch and Mystic North were also reviewed and also rated "Functional – At Risk" for similar reasons as the Crooked Creek assessment. Whitetail Gulch was reviewed and found to be as "Proper Functioning Condition – no apparent trend." Slate Creek was evaluated above the Rahn private property. This location serves as a watering location for livestock from Mystic Pasture and from Redfern Pasture on the Tigerville Allotment; both pastures have side by side water lanes to access the creek. Both lanes were rated as "Proper Functioning Condition" with downward trend because livestock bank trampling was affecting streambank stability, and riparian vegetation was lacking in diversity and abundance. Another Slate Creek segment was reviewed downstream from the Rahn property, and was rated as

"Functional – At Risk" with downward trend. The creek appeared to have been channelized for irrigation purposes at one time, and many areas were observed with rough, bare streambanks.

Since concerns regarding the condition and trend of the riparian areas were noted in Mystic and Whitetail Pastures by the PFC assessments, two Designated Monitoring Area (DMA) were established. Each DMA has a MIMS transect to document baseline conditions, and compare results against desired threshold levels. Slate Creek MIMS DMA #9 shows Nebraska sedge and smooth brome as dominant species, but streambank alteration is very high and exceeds threshold levels. Streambank stability ratings are less than the desired threshold and the percent hydric plants is 30% versus a desired threshold of 80% or better. The duration of use by livestock could be too long and such use continues to keep this portion of Slate Creek from healing. The same could be stated for the upstream segment of Slate Creek above the Rahn property. Another transect was established at Whitetail Crooked Creek MIMS DMA #2. This site is dominated by Kentucky bluegrass and riparian vegetation is not as abundant as it should be for this creek. The streambanks are rated very high for stability despite the streambank alteration percentage exceeding the desired threshold level. The percent of hydric plants is well below the desired threshold – measured at 5% versus a target of 80% or better. The duration of use could be preventing remnant riparian species from re-colonizing in the site. The soils of this area are similar to Rimmer Allotment and seem to help stabilize the stream channel despite heavy livestock use.

Range improvements have been maintained and are in relatively good condition throughout the allotment, although they are approaching 40 years of age and some deterioration is occurring. There are 16 spring developments, 23 ponds, three tanks, and almost 13 miles of fencing. The permittee used a range rider over the past several years with varying degrees of success. Livestock tend to be out of place and in the wrong pasture, particularly towards the later part of planned use - which is a reflection of a lack of forage or water or both. Salt placement has been in compliance at times, and in some instances too close to water sources. The permittee owns a corral and holding pasture in close proximity to this allotment, near the southwest corner of the Hay Draw Pasture and along the old Hill City Road.

Browner Spring development is not working. A protective exclosure in Whitetail Gulch is overgrown with brushy vegetation and no longer necessary. An old drift fence on the lower end of Crooked Creek needs reconstruction. A fen in lower Daugherty Gulch is unfenced from livestock use. An old spring exclosure in the north end of the Mystic Pasture is in need of reconstruction. The spillway on the only pond in the Slate School Pasture is eroding from high water flows. Protective fencing around Daugherty Spring needs enlargement to protect willows and riparian areas.

Tigerville Allotment

The Tigerville Allotment is 5,896 acres in size, and its eastern boundary is located approximately two miles northwest of Hill City, SD. The allotment is over six and one half miles long on a west/northwest to southeast axis, and varies in width from less than a mile on the west end to three and one half miles wide on the east end. It is bordered by the Deerfield Road and Newton Fork on the south, Gooseberry Trailer Park on the west, Slate Creek and the south end of the Redfern Allotment on the north, and Marshall Gulch on the east. Other prominent features include Lena Gulch (also called Burnt Fork), Lowden Mountain, Tigerville Draw, and Redfern Mountain. The Mystic County Road splits the allotment into roughly a west third and an eastern two thirds

parcels. The allotment tends to drain from north to south into Newton Fork Creek which eventually flows into Spring Creek within Hill City. Stringers of aspen are visible throughout the allotment, although many stands are impacted by conifer encroachment. Riparian areas are associated with Slate Creek, Newton Fork and its tributaries, Lena Gulch, and Marshall Gulch. The allotment has been largely forested with Ponderosa Pine of varying densities.

Compared to the other eight allotments in this project, the Tigerville Allotment's history is relatively new. Prior to 1969, this area was actually part of three different allotments: Slate Prairie, Redfern, and Hill City. Records indicate two to six permittees were involved, and each permittee had their own assigned area and grazed livestock season-long. Riding and salting were the main distribution tools. In 1969, a new AMP was written, and one permittee had his scattered permits consolidated into the new Tigerville Allotment. His season of use was reduced to June 1 – October 25 from a previous ending date of October 31. Permitted numbers were set at 102 cattle for 650 AUMs. The 1969 plan notes that the allotment is located in primary big game winter range, and the objective is to obtain maximum forage production for wildlife and big game and "achieve optimum vegetation, soil and water conditions." A range improvement development plan was initiated with over ten miles of new fencing planned along with 16 new ponds, 10 new spring developments, and six cattleguards would be installed. The result would be a four pasture rest rotation system which would become a four pasture deferred rotation, if a drought was in progress. Another 62 acres of Western snowberry would be sprayed to reduce concentrations and increase forage production. At that time, the Tigerville Allotment occupied present day terrain except for the Marshall and West Side Pastures (then part of the Five Points Allotment and re-assigned in 1997), and the Gooseberry Pasture has since been re-assigned to the Newton Fork Allotment – also in 1997. Since Gooseberry Pasture resides south of the Deerfield Road, the trade made movement of cattle easier since they do not have to be trailed over the paved highway. The 1969 plan also stated that an increase in permitted numbers may occur after the development program is completed and assessments made of capacity. At some point, this occurred as today 112 mature cattle (cow/calf) are permitted – which is about a 10% increase. File records also showed that sometimes cow/calf pairs and yearlings were grazed.

The Tigerville Allotment is managed today as a five pasture deferred rotation sequence of use from June 1 (depending on range readiness)to October 25 by 112 mature cattle (cow/calf) owned by one permittee. Maximum AUMs is 715 under a ten year term grazing permit. The entire allotment is classified as big game winter range. Livestock are moved to the next pasture when allowable proper use of 50% by weight is reached. Residual levels (or remaining height of key plant species) have not yet been prescribed for riparian areas. Allotment is projected by capability grazing modeling to be under stocked by approximately 4% of the permitted livestock numbers (about 12 mature cattle), but the need to improve or maintain the condition of riparian areas preclude any additional livestock numbers. Recently several large timber sales and sanitation actions (for mountain pine beetle infestations) have occurred, and the remaining pine stands are now more open. Other approved project planning areas are now coming on line and would further reduce pine densities. These treatments would result in less conifer encroachment into primary rangelands, and open up secondary ranges, as well as resulting in more forage and browse for all animals.

Water supplies within the allotment vary – generally spring and creek sources continue to flow water even in a drought, but constructed stock dams would be dry unless a summer thunderstorm event occurs. The dependable sources are adequate, but in drought years livestock use is

concentrated by the lack of water from non-flowing sources. The lack of water concentrates use and causes some areas to be overused. The reduction in basal area of pine from recent timber work generally results in less water use by trees and perhaps additional supplies for ponds and seeps.

The allotment's upland sites have been monitored for utilization seven of the last ten years. The ten year allotment average for utilization is approximately 50%. Use for the past three years has averaged 56%. Past field reviews found a wide variety of grasses and forbs in this allotment, with the grass component generally dominated by Kentucky bluegrass and smooth brome in all pastures. Present percentages of bare ground and noxious weed infestations (Canada thistle and Leafy spurge) are not an area of concern at this time, but continued vigilance is necessary and some treatment efforts are on-going.

The condition and trend of upland vegetation is represented by transects at Lena #2 and Redfern #1 with Lena #2 rated as "Moving towards Desired Conditions" because overall conditions appear in good condition – a good diversity of species are found, and bare ground is minimal. The Lena transect's ratings also depict conditions and trend for the Deer Park, Tigerville, West Side, and Marshall Pastures. Redfern #1 is rated as "Not Meeting Desired Conditions" because utilization for the past three years is exceeding proper allowable use. This elevated use is increasing bare ground and reducing plant vitality. As expressed for Redfern Allotment, there are concerns that allocated forage for wintering wildlife in this pasture is being compromised by overuse of primary rangelands.

Riparian sites in this allotment were assessed in 2008. Multiple PFC assessments and ratings were made across this allotment. Gooseberry Draw (Deer Park Pasture) was rated as at "Proper Functioning Condition" with no apparent trend; this site is a confirmed fen and a variety of riparian vegetation is present. Extensive use by wintering elk was noted. With recent timber sale and hazardous fuels treatment activities, an increase in livestock may occur since the area is more open. Slate Creek meanders through a portion of the Redfern Pasture, and two water lanes or gaps exist for livestock watering. Both lanes serve as a watering location for livestock from Mystic Pasture, Slate Prairie Allotment, and for the Redfern Pasture on the Tigerville Allotment. Both lanes were rated as "Proper Functioning Condition" with downward trend because livestock bank trampling was affecting streambank stability, and riparian vegetation was lacking in diversity and abundance. A PFC assessment in the "Mini" Pasture (located in the southeastern corner of the Redfern Pasture and west of Mickelson Trail) resulted in a rating of "Functional – At Risk with downward trend because bank shearing from hoof action, hummocks, and the riparian area is not at its potential extent. An assessment downstream from this location (east of the Michelson Trail – Tigerville Pasture) was dramatically different – and resulted in a rating of "Proper Functioning Condition" with no apparent trend at this time. Two assessments in Lena Gulch and Newton Fork found similar conditions and resulted in a rating of "Proper Functioning Condition" for the Lena Pasture. Another PFC was completed in West Side Pasture and noted breeched beaver dams, multiple channels, upland shrubs growing into the riparian area, and pine growing in the channels. This area was rated "Functional – At Risk with no apparent trend. The last PFC was conducted in the Marshall Gulch Pasture near NFSR 254 and was rated as "Functional – At Risk" due to bluegrass growing up to channel's edge, willows being heavily used by livestock and big game, and channel is incised. There are some indicators that upward trend may be starting to occur if use by livestock remains at present level. This area was extremely overused in 1996-97 when the area was under a different allotment and permittee. The Forest Service took administrative action and corrected the issue and re-aligned allotments and pasture boundaries.

Since concerns regarding the condition and trend of the riparian areas were noted in Redfern Pasture by the PFC assessments, a Designated Monitoring Area (DMA) was established. The DMA has a MIMS transect to document baseline conditions, and compare results against desired threshold levels. Mini Pasture MIMS DMA #1 shows willows overused by animals, hummocks present, stable streambanks (similar soils as Rimmer and Slate Prairie), and streambank alteration is excess of threshold, and percent hydric vegetation is less than desired threshold level because repeated use as a watering location for Redfern and perhaps Tigerville Pastures.

Range improvements have been maintained and are in relatively good condition throughout the allotment, although they are approaching 30 to 40 years of age and some deterioration is occurring. In recent years, the permittee has cost shared with the Forest Service to construct pasture boundary fencing to split Tigerville and Lena Pastures, and to control off allotment livestock drift on the southern end of the Lena Pasture west of Burnt Fork. There are four spring developments, 19 ponds, and over 19 miles of fencing. The permittee has successfully used a range rider over the past several years. Salt placement has been in compliance at times. It is difficult to haul in to or remove livestock from the east end of the allotment because of the narrow access road, so most years cattle are unloaded in the Redfern Pasture, and then moved west to Deer Park or east as needed. Livestock are generally removed from the private corral site west of the Deer Park Pasture.

There is no corral on the west end of the allotment, and the Marshall Corral is defunct and needs removal or renovation to an appropriate size. A spring exclosure in the Tigerville Pasture needs enlargement to further protect riparian vegetation. An old fence between West Side and Lena Pastures need renovation or removal. The fen in Gooseberry Draw is unfenced, and sale and hazardous fuels treatments may permit easier livestock access to this portion of the Deer Park Pasture.

Environmental Consequences

Alternative A

Alternative A is the no action alternative. Under this alternative, grazing would not be reauthorized and the current permit holders would be notified that their term grazing permits would be cancelled. All term grazing permits would be cancelled after two years, pursuant to Forest Service Handbook (FSH) 2209.13 part 16.24, and Code of Federal Regulation (CFR) 36 CFR 222.4(4)(1). The FSH and CFR regulations indicate that a two-year notification is required prior to cancelling a permit, except in emergency situations.

The no action alternative would close eight allotments, eliminating livestock grazing from 85,055 acres of National Forest System lands. Any type of grazing permit – term, temporary, and livestock use would not be issued for any of the eight affected allotments. A subsequent NEPA analysis and approved decision prior to restock for livestock grazing or temporary grazing is currently required. Authorized use for purposes other than livestock production for the any of the eight allotments may be considered and issued as a Livestock Use Permit.

Maintenance of range developments on the allotments would no longer be the responsibility of the permittees since they no longer are issued a permit. Developments built to facilitate livestock management, including allotment and pasture fences, livestock enclosures, and stock water ponds and water troughs would be abandoned. Developments built to enhance or monitor wildlife habitat,

such as water developments and big game enclosures would remain in place and would continue to be maintained by the Forest Service or perhaps cooperators.

The following structural improvements would be abandoned, and many removed:

- Approximately 145 miles of fence.
- 219 water developments.
- Approximately nine miles of pipeline.

Spring boxes and underground pipes associated with water developments would be abandoned; pipes would be disconnected. If left in place, pipes would be capped on one or both ends to prevent water from flowing through the pipes. Water storage and stock tanks not assumed by wildlife would be removed. Cattleguards that are no longer required would be pulled and pits filled with rock and soil. Unused fences would be removed as funds permit or opportunities become available such human resource labor such as Youth Conservation Corps or similar programs. All salvaged materials would be cached for re-use, recycled, or hauled to an appropriate landfill location.

Direct Effects and Indirect Effects Common to All Allotments

This alternative would require the cancellation of all grazing permits upon implementation of the decision and resolution of any appeals. When grazing permits are cancelled to devote National Forest System Lands to another public purpose that precludes grazing, Forest Service Handbook 2209.13, Section 16.6, requires that the permit could not be terminated until two years after the notification of each affected permittee (36 CFR 222.4(a)(1)).

If livestock were removed from these grazing allotments, there would no longer be direct effects to the soils or vegetation from livestock grazing or trailing. Effects of livestock on riparian ecosystems would be eliminated, as well as including any trampling or sloughing of streambanks in areas that are currently accessible to livestock. There would no longer be browsing of riparian shrubs by livestock. If this alternative is selected, there would be no need to implement adaptive management and said options shown in Table 2-1.

Most range improvements are the assigned responsibility of the grazing permittee to annually maintain and repair as needed. If the term grazing permits were canceled, the improvements would be abandoned and subsequent decisions would have to be made as to which improvements would remain and which ones would be removed. For the improvements that were to remain, funding for the maintenance of them would have to be secured. Maintenance of unassigned allotment boundary fences would be assigned to the adjacent permittee.

Permittees would need to be reimbursed for their amortized share of cooperative range improvements where they participated in the development (FSH 2209.13, Chapter 70).
Ending permitted grazing on an allotment would reduce or eliminate a permittee's livestock enterprise, unless they find a new location to graze or increase numbers within an existing permit, lease, or on their own private lands. If their Forest Service permit is not replaced, they would have fewer expenses from transporting and maintaining livestock on the National Forest, and they would also have less income from the animal business enterprise. With less livestock, the permittee would not expend dollars in the local community for feed, fencing, salt, veterinary services, trucking, fuel, and related expenses. Some permittees would not be seasonally hiring a range rider. With fewer

profits from the annual sale of livestock, there may be less discretionary spending on household items or farm/ranch equipment needs.

Initially, removing livestock from the grazing allotments would be beneficial to rangeland condition. Wildlife use would still occur, but in the absence of livestock grazing - utilization levels would be significantly lower than what currently occurs. This would lead to an accumulation of dead plant material that would initially be beneficial by providing additional protection to the soil from erosive forces, as well as leading to an increase in the organic matter in the soil. A dense litter cover reduces evaporation of soil water and this provides an optimum environment for germination and seedling emergence (Haferkamp and Karl, 1999).

Grass plants generally evolved with periodic removal of vegetation from various causes (including fire, wild ungulates, insects, etc). The buildup of litter in mixed grass vegetative types can inhibit the growth of vegetation (Molinar et. al. 2001, Knapp, et al., 1986). Excess mulch accumulations can retard forage productivity and cause unwanted changes in composition. The ID Team believes this build-up could potentially cause a decrease in palatability and overall plant health, and may lead to further detrimental effects. For example, while a dense litter cover generally reduces evaporation of soil water, it may provide an optimum environment for germination and seedling emergence of undesirable plants (Haferkamp and Karl, 1999). The ID Team has visually observed the increased presence of Canada thistle in some ungrazed areas in the project area. Additionally, recent research in mixed grasses prairies indicates a lack of grazing by herbivores favors non-native plant expansion and invasive plants, while grazing can increase diversity and favor restarting the native plant community (DeKeyser, 2009).

Forest Plan Guideline 5.4A-2502 provides direction for the Norbeck Wildlife Preserve to take advantage of opportunities to transfer forage use from livestock to wildlife. Alternative A would contribute to meeting this guideline by vacating livestock grazing from pastures or portions thereof in one allotment, thereby transferring forage use to wildlife. Affected pastures in the Palmer Gulch Allotment are Ford, Palmer, Rabbit, and Sunday. Aspen regeneration work in the Palmer Creek Pasture would not need to be fenced to exclude livestock use and trampling, and the pond/spring project (Fender Place) in the Rabbit Pasture would also not require fencing from livestock use.

There would be no opportunity to create “Forest Reserve Allotments” to satisfy the guideline to build in allocations for drought or wildfire/prescribed fire contingency needs.

Permitted livestock would no longer enter and affect the Spring Creek Total Maximum Daily Load Study Area (TMDL), and over time the contribution from accumulated solids, fecal coliform, and nitrates would decline from the Palmer Gulch and Tigerville Allotments. Other Forest Service allotments outside of the Mystic Range Project boundary within the Spring Creek Watershed may continue to contribute to the TMDL unless additional mitigation or design criteria are implemented.

Some recreationists and hunters also leave gates open on all allotments. Since the adjacent rangelands around vacated allotments generally still have permitted livestock, the unplanned use by stray livestock may continue to occur each season to varying degrees. This causes additional use in excess of utilization standards already met or consumes forage that should be available later in the season.

Traffic would no longer be impaired by livestock on the Sheridan Lake and Deerfield Highways. Any occasional livestock encountered would have to be strays from other allotments still under term grazing permit use, and their owners would be notified to remove their livestock from the ROW. The Spring Creek Trailhead would no longer be impacted by permitted livestock.

However, grasses evolved with periodic removal of vegetation from various causes (including fire, wild ungulates, insects, etc). After a certain point is reached, the buildup of litter would begin to inhibit the growth of vegetation (Knapp, et al., 1986). This could potentially cause a decrease in the productivity, palatability and overall plant health, especially to many of the non-native species that dominate these sites.

Many wildlife species depend upon productive grasslands. Lacey and Van Poolen (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 would not guarantee maximum herbaceous plant production. Volland (1978) found that a protected Kentucky bluegrass meadow reached peak production in six years and then declined until production was similar to the adjacent area grazed season-long. Clary and Webster (1989) reported that the accumulation of litter over a period of years seems to retard herbage production in wet meadow areas; some grazing of riparian areas could have beneficial effects.

While there is abundant documentation of positive changes when removing livestock from 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 would 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). In addition to the loss of plant vigor and decrease in rangeland health, the accumulation of litter allows fine fuels to accumulate, which increases susceptibility to fire.

Removal of livestock from these allotments could lead to an increase in the level of wildlife use on adjacent lands. Recent research indicates that the selection of foraging sites by elk is influenced by differences in forage quantity and quality created by dispersed livestock grazing in rangeland landscapes (Crane et al, 2001). Results indicate that in the fall, winter, and spring elk avoided areas that were not grazed by cattle the previous summer. The results also show that prescriptive livestock grazing can influence where elk graze. The removal of livestock from these allotments could cause a shift in elk foraging areas, leading to increased grazing pressure on the adjacent allotments as well as private lands.

Removal of livestock would also allow for riparian areas that might not be in desired condition due to livestock damage to recover. Riparian species would be expected to increase in cover and frequency. Riparian zones could possibly expand beyond their current location as streambanks stabilize and riparian graminoids and shrubs become established on previously un-vegetated or

unstable sites. This would probably continue until another disturbance changes the function of the stream system.

No grazing would promote the accumulation of dead plant material that would deny native species sunlight and nutrients over time. For example, annual brome species such as cheatgrass are known for their ability to grow in litter. Excessive litter may actually increase the competitive ability of these undesirable species. At this time, the ID Team considers the presence of cheatgrass within the project area to be very limited, and not an issue at this time.

A build-up of fine fuels, regards of the source or species, increases the chance for a wildfire to ignite and spread as each year without livestock grazing occurs. Any large acreage ignition may disrupt grazing use on adjacent, still under permit grazing allotments.

Cumulative Effects

Cumulative effects were analyzed for the project area consisting of the Bald Horse, Deerfield, Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville Allotments. The effects were considered within the respective allotment. Since range management direction is unique to each designated allotment, and no livestock herds are moved or mixed from the Mystic Range Project to other grazing areas, the spatial boundary is the perimeter of each allotment plus all private lands inside and directly adjacent to each respective allotment.

The timeframe analyzed for cumulative effects is from this point forward since the vegetation used by livestock is generally recognized as altered by past activities as noted in the Introduction in Chapter 3. It is currently not feasible for these allotments to return to a “natural” vegetative state without major effort including ground disturbance and reseeding projects, use of expensive mechanical and chemical practices, and commitment of the agency.

Adjacent private lands have occasionally been developed into ranchettes. Some property owners graze livestock (primarily horses) on their property. Some overgrazing on private land does occur. It has the same impact of reducing the vegetative cover, increasing the amount of sediment transported into the streams, and increasing the likelihood of noxious weed infestations. Private in-holdings within or adjacent to vacated allotments may not have fences to maintain since livestock have been removed. The opportunity for incidental unauthorized use by privately owned livestock, not permitted to graze may increase within the vacant allotment.

OHV and motorcycle use would not impact livestock distribution since permits are no longer issued, but unauthorized use may occur riparian areas on sporadic occasions. The forest travel management plan was approved in 2010, and unlimited motorized use is now prohibited upon implementation. There are also developed road and trail systems used by equestrians, hikers, and mountain bikers scattered in all allotments. These uses would continue with even if permitted grazing ceased.

Fine fuel loads may increase without livestock grazing. High intensity wildfire can adversely affect soil conditions and provide sites for colonization of noxious weeds. The use of prescribed burning can provide some of the beneficial effects of wildfire with a reduced risk of adverse effects. Prescribed fires can benefit rangeland health by opening up forest canopies and not only increasing understory vegetation, but also removing decedent vegetation thus promoting an

increase in new growth that is relished by wildlife. It will help maintain or restore upland grasslands and meadows from pine encroachment while increasing available forage for wildlife.

Prescribed fire will no longer have a direct short-term impact on permittees and livestock grazing since the allotment is vacated; there will be no need to plan sufficient recovery time in burned areas according to the forest plan. Both wildfire and prescribed fire are expected to have short-term adverse effects on range conditions but over the long-term effects are expected to be beneficial wherever they occur for wildlife browse and forage use. See the Fire/Fuels Specialist report for more information.

Past and future timber harvest and prescribed fire may have created and would continue to create transitory or secondary range and available forage for wildlife. These timber sales and related activities are listed in the Appendix C. Treatment efforts vary by project area but generally include provisions for conifer removal from meadows, riparian areas, and hardwood stands. Transitory range is an area that temporarily produces an increase in rangeland vegetation (Vallentine, 1990). These areas occur when the tree and sometimes overstory are removed allowing the grass/forb component to take full advantage of available sunlight and moisture. This would improve the quality and quantity of the forage available to wildlife. Wildlife distribution throughout the project area would probably increase as treatment areas are opened up. Any impacts to the primary range usually located in meadows, upland grasslands and riparian areas may lesson as wildlife distribute throughout the transitory range. Increased ground cover protects soil resources from erosion and high temperatures. Increased herbaceous vegetation has a positive effect on riparian and water conditions creating favorable habitats for all types of terrestrial and aquatic life. This would aid in maintaining or moving these communities towards desired condition.

Road construction due to timber sales may have an impact on vegetation spreading noxious weeds. Since livestock are no longer permitted, the permittee(s) would no longer need to use closed or gated routes for improvement maintenance, salting, or checking on livestock distribution. Livestock would no longer use roads and skid trails to move throughout an allotment. The closing of roads or obliteration of roads is beneficial from a resource standpoint.

Noxious weeds are currently being treated with Integrated Pest Management (IPM) approached throughout the project area, and such action would continue to be accomplished contingent on funding. Ground disturbance due to livestock grazing practices occurs at salt grounds and watering facilities, and would cease with no permitted grazing. Wildlife use may initially continue to disturb such sites until they revegetate over time – with salt grounds taking the longest since the soil's salinity is elevated. Wildlife can transport weed seeds from one area of infestation to these areas of disturbed soil. It is likely that with continued treatment of noxious weeds, the infestations will not increase in size and may even eliminate some small infestations. Noxious weed control was previously addressed in the Black Hills National Forest Noxious Weed Management Plan that resulted from a Decision Notice and Finding of No Significant Impact. The extent of weed infestations are discussed in the decision signed in 2003, and a three year action plan is currently out for 2008-2010.

Big game animals, especially elk and deer, would continue to have an effect on herbaceous vegetation since the dietary overlap between elk and livestock is similar (Zimmerman 2004, Beck and Peek 2005). Grazing management of forage by the Forest Service takes wildlife forage

utilization into consideration, and without permitted grazing initially more forage and browse would be available for wildlife use. In the future, without some disturbance agent, it is anticipated that the overall amount of forage and browse would decline as forage become thatched from non-use by livestock.

Additionally, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These vegetative treatments will increase forage and browse production for wildlife.

The end purpose for adaptations of forest and range ecosystems is to make adjustments in management that ideally reduce the negative impacts of climate change, and take advantage of any positive impacts (Blate, 2009). Without permitted livestock grazing, there would be no adaptation needed to adjust range management. There may be other reasons for adaptations to assist other resource management.

Alternatives B and C

Direct and Indirect Effects Common to Both Alternatives

Both action alternatives would reauthorize grazing on the eight allotments. The permits would be issued for an approximate season of livestock use, kind and class of livestock, and stocking guidelines (approximate AUM's). The actual number of livestock and season of use would be determined each year prior to grazing, outlined in the Annual Operating Instructions, and dependent on allowable use. Factors such as drought, wildfire, prescribed fire, other resource conditions, and specific management objectives could all influence livestock number and season of use.

For all pastures in each alternative, livestock would be moved to the next pasture before the allowable proper use of 50% by weight is exceeded or riparian stubble height is reduced to four inches (Forest Plan Standard 2505). Allowable proper use has been part of the existing permit requirements for a long time. It is intended to ensure sufficient forage remains for other resource needs when grazing is completed, such as for big game and watershed protection purposes. Even when meeting allowable use standards, however, certain pastures in the allotments have experienced unacceptable effects to riparian areas and streambanks. Alternatives B and C include a new riparian stubble height requirement designed to address this issue.

The new riparian stubble height requirement could have an immediate effect on actual use in some pastures. It is likely that some pastures with riparian areas would trigger the riparian stubble height requirement to move well before the allowable proper use by weight of 50% is reached. This means that the livestock would move through the pasture rotation more quickly than in the past, and may then need to leave the allotment earlier in the season than the typical or permitted timeframe. Alternatives B and C both provide options for dealing with the issue of protecting riparian areas and streams while providing for grazing needs. Alternative C provides more ability to do so by constructing new structural improvements, but at a higher cost, as discussed later in this chapter.
Both Alternatives B and C are expected to improve range and other resource conditions to varying degrees. Both would increase residual vegetation in areas where it is at a less than desirable condition, improve plant vigor, lessen the amounts of bare ground in areas where it is currently too

prevalent, and reduce weeds and other undesirable plants. Both, to varying degrees, should increase riparian vegetation, reduce soil compaction, and stabilize streambanks, promoting riparian health overall. The rate of improvement is expected to be slower than Alternative A because livestock grazing is still occurring, while with the No Action Alternative all livestock grazing is terminated after two year's notification.

Both Alternative B and C include design criteria and adaptive management approaches and promote even distribution of livestock use to varying degrees. This means that previously ungrazed plants would have more chance of being grazed (stimulating growth) and that each individual plant would be grazed fewer times, providing recovery and development of each individual plant. Achieving more even pasture use means that livestock may be able to stay longer in a particular pasture as opposed to moving quickly through the allotment if cattle are allowed to congregate, especially in key areas. If monitoring does not indicate progress towards desired conditions, it may be necessary to change proper allowable use percent utilization by weight from 50% to 45%, and/or increase residual stubble height to six inches.

The environmental effects provided for each alternative indicates any potential reductions in actual use days by allotment. These potential reductions are based on a best estimate of what might be necessary to achieve desired resource conditions if other measures are not effective. These estimated actual "use days" should not be confused with "permitted days". Permitted days are the days stated on the grazing permit. There is no guarantee that these permitted days would be available because factors such as drought, wildfire, prescribed fire, other resource conditions, and specific management objectives could all influence livestock number and season of use.

If any of the management actions result in changing the permitted use to reduce AUMs due to the concerns about rangeland resources, the Forest Service would meet with the permittee and discuss rangeland resource conditions. If necessary, 36 CFR 222.4(a)(8) requires the authorized officer to provide the permittee with one year's advance notice prior to implementation of the decision, except in emergency situations. This notification may not be needed if the permittee and authorized officer both recognize and agree that such modification of permitted livestock numbers, season of use, or both are needed. This requirement does not apply to year to year changes in actual use needed to comply with utilization by weight and riparian stubble height standards.

Alternative B - Effects Common to All Allotments

There are some areas that are not meeting desired conditions. Some improvement in upland and riparian conditions and trends should occur with adjustments in distribution and grazing instructions for pasture use. The rate of improvement is expected to be slower than Alternative A (livestock grazing terminated after two year notification) because livestock grazing is still occurring. The rate of improvement for Alternative B may be somewhat faster than Alternative C. This is because Alternative C requires the construction and implementation of additional improvements to better distribute livestock use and protect riparian areas, streams, and other resources. Alternative B does not include these new structures, but relies on immediate movement of livestock before thresholds are reached. The projected improvement is based on the assumption that each permittee primarily invests to some degree in the methods available, such as: salting and/or supplement use, range riding to influence animal behavior, and culling non-compliant

livestock. Improvement is also based on the new riparian stubble height requirement that requires cattle are moved to the next pasture before this threshold is exceeded.

Alternative C - Effects Common to All Allotments

Alternative C includes the same requirements as Alternative B for monitoring use and conditions and moving livestock before standards are exceeded. It also includes design criteria and all adaptive management approaches shown in Table 2-1. It provides for construction of new range structures to address resource issues and to better distribute cattle use, both as required actions and also as adaptive options. These additional structures obviously come with increased costs.

As with Alternative B, the burden to make Alternative C a success is on the permittee(s). Diligence in monitoring livestock use and moving livestock, new project costs from the initial investment in structural improvements, as well as continuing to maintain existing improvements and reconstruct depleted structures would place demands on each permittee. Utilization and riparian standards apply immediately and do not wait until after structures have been completed. It is in the permittees best interest to get high priority improvements completed sooner rather than later, as it could affect actual grazing use on the allotment.

While new range structural improvements may resolve some resource concerns, it remains to be confirmed by monitoring after structures are completed. The end result maybe within another five to ten years, based on monitoring results, additional adaptive options may be needed including AUM adjustments to balance permitted use with movement towards desired conditions. Continued monitoring after grazing capacity is confirmed or adjusted is necessary to assess range condition and trend, and perhaps make additional adjustments if progress towards meeting desired conditions is not on track.

Bald Horse Allotment

Alternative B

The 27,828 acre Bald Horse Allotment is grazed using a nine pasture deferred rotation system from 06/01 to 10/26 each year, currently using 299 mature cattle (cow/calf pair) and approximately 1,921 AUMs. Alternative B would continue this practice but would require some adjustments in use of individual pastures. There are no grazing capacity issues associated with this allotment based on capability modeling. The current situation poses a risk of livestock-vehicle collisions along the Sheridan Lake Road, and allows livestock direct access to Spring Creek resulting in bank trampling. Livestock occasionally drift into the Pactola Basin, an area now restricted from grazing.

Overall, the allotment is generally meeting or moving towards desired conditions. The condition and trend of upland vegetation in most areas are “Meeting Desired Conditions.” While native grasses generally do not dominate upland plant communities, they are present and co-exist in varying degrees with non-native grasses. A diverse assortment of forbs together with grasses and developing shrubs provide a mosaic of plant species, a variety of vegetative structures, and generally effective ground cover to maintain soil stability and provide wildlife habitat.
It is expected that upland vegetation conditions would continue to be maintained or improved under Alternative B by moving livestock before exceeding the 50% utilization by weight standard. The one upland site not meeting desired conditions, Middle Horse #4, has experienced

a reduction in bare ground since 2005, and this positive change is anticipated to continue with this alternative.

Riparian conditions in the Middle Horse Pasture are "Not Meeting Desired Conditions" because Kentucky bluegrass is dominant and the percentage of hydric plants is below desired thresholds, streambank stability is below desired levels, and streambank alteration exceeds threshold levels. Riparian conditions in the Middle Victoria Pasture were rated as "Moving towards Desired Conditions"; streambank stability is at acceptable levels, although percentage of hydric plants is well below threshold levels and streambank alteration exceeded threshold levels.

Required actions in this alternative address riparian issues by: 1) varying the order of pasture use; 2) reducing the number of days of grazing use in the Middle Horse Pasture; 3) reconstructing exclosures for the Van Pelt Spring, West Horse Spring, and springs in the South and Middle Bald Hills Pastures; 4) seal an existing pond in the Lower Victoria Pasture; and 5) compliance with the new four inch riparian stubble height requirement. These actions should improve streambank alteration ratings in the short term, and streambank stability, the percentage of hydric plant species, and the extent of riparian vegetation should improve over the long term.

Implementation and effectiveness monitoring of conditions in the Middle Horse Pasture should help determine the effectiveness of the above actions. If no or inadequate improvement occurs, the most likely adaptive option(s) is to decrease this pasture's use to 20-22 days per season, and/or decreasing utilization standards by weight for upland vegetation to 45%, and/or increasing the residual riparian stubble height to six inches, or some combination of these three options. Adaptive options for the Middle Victoria Pasture include reducing days of use to five per season, and consideration of similar restrictions in upland vegetation use and residual riparian stubble heights like Middle Horse Pasture.

Required actions in this alternative to address the issue of livestock drifting into Pactola Basin are to replace a gate that sometimes gets left open with a cattleguard, and reconstructing current fencing along the Centennial Trail as needed in the Prairie Creek Pasture. It does not address the livestock-vehicle collision risk, nor does it exclude livestock access to Spring Creek.

Actual grazing use may have to be reduced in both the Middle Horse and Middle Victoria Pastures in order to improve conditions. It is likely that lost use days could be made up from underused capacity in other upland dominated pastures. Hence, no reduction in overall grazing use is expected for the allotment.

Alternative C

Alternative C incorporates all the provisions of Alternative B. It also includes new required structural improvements aimed at providing better riparian and other resource conditions, better livestock distribution, and removing livestock access from high speed roads. Probable adaptive options (See Table 2-1) for various structural improvements are also included, should initial proposed actions not effect movement towards desired conditions.

In addition to positive changes in upland and riparian conditions noted for Alternative B, this alternative requires new water developments in the West Horse, Middle Victoria, and Burnt Ranch Pastures, and fencing a pond and piping water to a water tank in the West Horse Pasture. These

water developments should help move livestock away from riparian areas. Once constructed, monitoring would determine progress towards desired conditions. Additional, adaptive options may include developing additional water sources to better distribute livestock in the Lower Victoria Pasture, constructing a water development and a boundary fence in the West Horse Pasture, a water development in the Middle Horse and North Bald Hills Pastures, and a spring exclosure fence in the Middle Bald Hills Pasture.

Alternative C also would reduce the potential for livestock-vehicle collisions along the Sheridan Lake Road by requiring fencing of the right-of-way. This fencing would also improve stream, riparian and trailhead conditions in that area by excluding livestock from Spring Creek. As a result of additional fencing and water developments, riparian conditions would be improved.

As with Alternative B, no reduction in overall livestock use is anticipated for the allotment.

Deerfield Allotment

Alternative B

The current 7,874 acre Deerfield Allotment is grazed using a six pasture system from June 6 to October 25 each year, with 102 mature cattle (cow/calf Pair) and approximately 628 AUMs. Alternative B would continue with the six pasture deferred rotation grazing system. There are no grazing capacity issues associated with this allotment based on capability modeling. The current situation poses a risk of livestock-vehicle collisions along Deerfield Road.

Overall, upland vegetation in this allotment is moving towards desired resource conditions. Noxious weed infestations, domination by non-native smooth brome and Kentucky bluegrass of the upland plant community in grasslands and meadows, and reduced amounts of native grasses resulted in the lesser rating of desired conditions. Effective ground cover to maintain soil stability and provide wildlife habitat is present.

Upland conditions would be expected to continue moving slowly towards desired resource conditions under Alternative B by moving livestock before exceeding the 50% utilization by weight standard. This alternative addresses the riparian issue through strict compliance with the new four inch riparian stubble height requirement. Compliance with the riparian stubble height requirement should improve streambank alteration ratings short term, and streambank stability would be expected to improve over the long term. The percentage of hydric plant species, width of riparian vegetation, and re-establishment of the willow community are also expected to improve over the long term. Compliance with this requirement would also limit repeated use of forage regrowth, which would result in improved plant vigor and health.

Riparian conditions in the Heely Pasture are rated as “Not Meeting Desired Conditions.” Kentucky bluegrass and Nebraska sedge are co-dominant, and riparian vegetation is present but of limited width with few willows (many willows were removed while in private ownership). The desired percent of hydric plants and streambank stability are below threshold levels, and the streambank alteration rating exceeds threshold level. The primary cause of these conditions is believed to be the length of time this pasture is grazed, since livestock graze the Heely Pasture for approximately 60 days each season (versus 21 days recommended in the WCP Handbook Ch.

10-12.1). This duration allows for repeated use of plant regrowth, and increased hoof impact that results in streambank alteration and affects streambank stability.

Implementation and effectiveness monitoring should help determine the appropriate livestock grazing use levels for the Heely Pasture. The likely effect of meeting the four inch riparian stubble height requirement is that actual use within the Heely Pasture would be less than the 60 days currently assigned. If no or inadequate improvement in riparian conditions occurs by following four inch riparian stubble height requirement, the allowable proper use by weight may also be adjusted to 45% for upland vegetation, and the residual stubble height for riparian vegetation may be adjusted to six inches. This could lead to a reduction in actual grazing use of up to 20-40 days. If days of livestock use are reduced in the Heely Pasture, it is unlikely this time could be made up in whole or part from underused capacity in other pastures.

Required actions in this alternative include reconstruction of a pond in the Gold Run Pasture. Alternative B does not address the livestock-vehicle collision issue on the Deerfield Road, does not provide additional protection to fisheries along Castle Creek, and does not provide for control of stray livestock.

Alternative C

Alternative C incorporates all the provisions of Alternative B. In addition, it would reduce the potential for livestock-vehicle collisions along the Deerfield Road by requiring the highway right-of-way to be fenced, and a cattleguard installed on the Ditch Creek Road. This new fencing would end livestock use of the Lake Shore Pasture and approximately six days of livestock grazing. Fencing along the Deerfield Road would also result in additional protection for fisheries habitat along Castle Creek. Required ridgeline fencing in the Trap and Baseline Pastures would facilitate better control of stray livestock.

Like Alternative B, it is unlikely that this alternative could carry livestock for the 60 days currently allowed in the Heely Pasture without causing negative effects to the stream and riparian area. Riparian conditions would be improved, more so than with Alternative B, under an adaptive option to fence off this area, however it would be expensive to do so and it is unknown whether this would ever be accomplished. Without excluding livestock from the riparian area, grazing use in the Heely Pasture is likely less as described in Alternative B. It is also unlikely that this time could be made up in whole or part from underused capacity in other pastures.

Palmer Gulch Allotment

The Palmer Gulch Allotment would continue the split between a North Half and a South Half.

North Half Palmer Gulch Allotment

Alternative B

The North Half Palmer Gulch Allotment is 4,843 acres in size and utilizes a five pasture deferred rotation system. The permitted use on the north half is from 06/01 to 10/10 currently using 74 cow/calf pair and approximately 424 AUMs. Alternative B would have a 44 day reduction in actual grazing use, since two pastures are not grazeable (Sawmill and Dump). Even with these reductions,

the North Half Palmer Gulch Allotment may be overstocked by approximately 14% (about nine mature cattle) based on capability modeling. The remaining three pastures would be split from the pastures in the south half of the allotment, creating a new allotment to be named Oblivion. The three pastures would operate as a deferred rotation system. The Ford Pasture currently receives limited livestock use within the Norbeck Wildlife Preserve. There is a risk of livestock-vehicle collisions along the Old Hill City Highway.

Overall, the north half of the allotment is meeting or moving towards desired conditions, although there are some concerns with riparian conditions, and a slight overstock situation may need resolution. While the condition and trend of upland vegetation is "Moving towards Desired Conditions," the ID Team believes this is a reflection of the permittee not grazing full numbers of permitted livestock in recent years. The presence of scattered noxious weed infestations and the minimal amount of native grasses resulted in the lesser rating of desired condition. Upland plant communities are primarily dominated by non-native grasses, such as Kentucky bluegrass and timothy. The percentage of bare ground is within limits, and effective ground cover to maintain soil stability and support wildlife habitat is present.

Upland vegetation conditions would be expected to continue moving slowly towards desired resource conditions under Alternative B by moving livestock before exceeding the 50% utilization by weight standard. Reducing allotment actual use to grazing capacity based on monitoring data would allow uplands to be grazed and not overused each season. It is possible that actual grazing use may be reduced by up to 19 days, or less livestock grazed, or some combination thereof.

Riparian areas are limited to two small stretches of Spring Creek in the Samalias Pasture, a short segment of Battle Creek (NFS land) and Palmer Creek (county ROW by bridge), and scattered seep/willow locations. There are concerns with unrestricted livestock access and the effect on Spring Creek in relation to meeting TMDL objectives (see Hydrology Section), trampling of limited seep sources, and an eroding drainage ditch occurring near Battle Creek.

This alternative addresses riparian conditions by compliance with the new four inch riparian stubble height requirement, and movement towards desired riparian conditions is expected. The likely effect of meeting the four inch riparian stubble height requirement is that actual livestock days of use may be further reduced. This may result in additional decreases in actual livestock use of approximately 10 days in the Samalias Pasture. If no or inadequate improvement in riparian conditions occurs, then the residual stubble height for riparian vegetation may be adjusted to six inches. Required reconstruction of the Joe Dollar Mine water tank and spring would improve livestock distribution into the uplands, as would cleaning out two ponds in the Ford Pasture, and maintaining three ponds in the Samalias Pasture.

This alternative does not address potential livestock-vehicle collisions along the Old Hill City Highway, riparian areas are not fenced to exclude livestock use, and the ditch is not repaired. The number of livestock reduced or less days of use would not be made up in other pastures because of the need to adjust livestock actual use to actual grazing capacity.

South Half Palmer Gulch Allotment

Alternative B

Alternative B would continue with the six existing pasture deferred rotation grazing system on the South Half of the Palmer Gulch Allotment, plus one winter on/off pasture (eventually phased out). There are no grazing capacity issues with this allotment based on capability modeling. In drought years, the permittee would continue to haul water to temporary tank locations; these sites require Forest Service approval prior.

Overall, the South Half Palmer Gulch Allotment is meeting desired conditions except for the Rabbit and Upper Bear Pastures. Upland vegetation condition in the Rabbit Pasture is "Not Meeting Desired Conditions." The presence of Canada thistle infestations, the minimal amount of native grasses and higher amounts of fringed sage than desirable resulted in the lesser rating of desired conditions. However, a reduction in the actual livestock use in the pasture initiated in 2005, combined with concurrent IPM treatment of Canada thistle, appears to have begun reversing the downward trend and resulted in improved conditions. Ground cover to maintain soil stability is improving but bare ground is still present. Upland vegetation condition and trend in the remaining pastures are "Moving towards Desired Conditions."

Upland vegetation conditions would be expected to continue moving slowly towards desired resource conditions under Alternative B. The Summit Pasture (on/off area) is being phased out because it incorrectly fences in 20 acres of NFS land with private property. This alternative addresses upland vegetation conditions through ongoing efforts to control Canada thistle, and by moving livestock before exceeding the 50% utilization standard. If these measures do not continue to show progress towards desired conditions in the Rabbit Pasture, the most likely adaptive option may be to decrease days of use in that pasture, and/or allowable proper use by weight may also be adjusted to 45% for upland vegetation.

Riparian conditions in the Upper Bear Pasture are rated as "Moving towards Desired Conditions." Kentucky bluegrass is the dominant vegetation but some riparian species are also present. The percentage of hydric plant species is below desired threshold levels, streambank stability exceeds desired threshold levels, but streambank alteration ratings are above desired threshold levels. The primary cause of these conditions is believed to be the length of time this pasture is grazed (45 days), which allows for repeated use of plant regrowth, and increased hoof impact that results in streambank alteration.

Overall, riparian conditions are expected to improve and continue moving towards desired conditions under Alternative B by moving livestock before the new four inch residual stubble height requirement is exceeded in all pastures. The likely effect of meeting the four inch riparian stubble height requirement is that actual livestock days of use may be reduced. Alternative B also requires moving a temporary water tank away from the riparian area in the Lower Bear Pasture. Compliance with the riparian stubble height requirement in the Upper Bear Pasture should improve streambank alteration short term, and the percentage of hydric plant species would be expected to improve over the long term. Compliance with this requirement would also limit repeated use of forage regrowth, which would result in improved plant vigor and abundance. If no or inadequate improvement in riparian conditions occurs by following four inch riparian stubble height requirement, the allowable

proper use by weight may also be adjusted to 45% for upland vegetation, and the residual stubble height for riparian vegetation may be adjusted to six inches. This could lead to a reduction in actual grazing use by 5-10 days reduction in Lower Bear and 15-25 days in Upper Bear.

Concerns about game animals and birds in the Norbeck Wildlife Preserve are addressed by prohibiting use in the Palmer and Sunday Pastures prior to June 15 each season to improve bighorn sheep lambing success, and generally ending use in these pastures around August 1 to provide vegetation re-growth and improve big game winter habitat.

North Half Palmer Gulch Allotment

Alternative C

The North Half of the Palmer Gulch Allotment would have a 20 day reduction in actual use because the Sawmill Pasture is not grazeable. There would be one additional grazeable pasture (Dump) and thus additional days of livestock grazing use compared to Alternative B (four pastures rather than three). Alternative C would require installation of privately owned cattleguards along the 1880 Train tracks, and cleaning of a pond before the Dump Pasture can be grazed. Livestock trailing use through and back across the Sawmill Pasture would be allowed for up to two days per year.

Alternative C includes all the provisions of Alternative B. Some additional required adaptive actions would improve resource conditions, more so than Alternative B. To improve riparian and stream conditions, required structural improvements include: 1) construction of up to one-half mile of new fence in the Samalias Pasture to restrict livestock access to Spring Creek; 2) fence off livestock access to Palmer Creek in the Keystone Pasture (also requires cattleguard on Twin Springs Road); 3) construct a new water development in the Keystone Pasture; 4) fence off springs and willows west of the Samalias trailhead and north of the Rustic Ridge Guest Cabins to restrict livestock access; and 5) reclaim a ditch at the headwaters of Battle Creek in the Ford Pasture to reestablish subsurface flows. The same fencing that would restrict access to Palmer Creek would also restrict livestock from the Old Hill City Highway. An additional adaptive option is to develop a spring and install a water tank in the Samalias Pasture.

Alternative C should maintain or move the area toward the desired condition. It provides more protection to streams and riparian areas than Alternative B, and also reduces the potential for livestock-vehicle collisions along the Old Hill City Road, which Alternative B does not. If implementation and effectiveness monitoring determines utilization and/or impacts in excess of allowable levels, then similar measures and actual use reductions may occur as discussed in Alternative B. Alternative C also includes the option as opportunities arise for constructing fences to reduce or eliminate grazing on portions of the Ford Pasture in the Norbeck Wildlife Preserve.

South Half Palmer Gulch Allotment

Alternative C

Alternative C includes all the provisions of Alternative B. The South Half of the Palmer Gulch Allotment would likely provide additional positive changes in resource conditions compared to Alternative B. Required fencing of the Fender Spring and pond in the Rabbit Pasture to exclude livestock would protect and improve wildlife habitat in the Norbeck Wildlife Preserve. As with

Alternative B, in drought years the permittee would continue to haul water to temporary tank locations. Habitat and resource conditions would also be improved by requiring fencing to exclude livestock from a spring on the north side of the East Zimmer Pasture, and installing reclamation structures to raise the water table along Palmer Creek in the Palmer Pasture. Approximately 0.4 miles of new fence along private land would also be required in the Summit Pasture, and the NFS lands presently incorporated with livestock use on private lands would be added back into the Rabbit Pasture.

Alternative C includes additional, adaptive options to fence a riparian area in the Lower Bear Pasture, and to enlarge the size of the pasture by constructing approximately 1.25 miles of new fence and installing a new cattleguard. It also includes an option to enlarge the size of the Upper Bear Pasture to address riparian concerns by constructing approximately one mile of new fence and installing a cattleguard. A reduction of 5-10 days of actual use in Lower Bear and 15-25 days of actual use in Upper Bear is less likely under Alternative C than in Alternative B due to these structural improvements. It is possible however that actual use would have to be reduced in these pastures if the measures included in Alternative C do not move the areas toward the desired condition. Alternative C also includes the option as opportunities arise for constructing fences to reduce or eliminate grazing on portions of the Rabbit, Sunday, and Palmer Pastures in the Norbeck Wildlife Preserve.

Porcupine Allotment

Alternative B

The Porcupine Allotment currently uses a Holistic Management (HM) team approach, which has been in effect since 1988. The allotment totals 9,858 acres and utilizes 12 pasture planned grazing from 06/09 to 09/30, currently using an average of 334 cattle (cow/calf with some yearlings) and approximately 1,652 AUMs. Variable numbers and season are allowed each year for this HM allotment. Alternative B would continue the existing HM grazing system and permitted average AUMs, resting one pasture per year over a 12 year cycle unless it is determined unnecessary in order to achieve specific resource objectives. There are no grazing capacity issues with this allotment based on capability modeling.

Overall, the condition and trend of upland vegetation in this allotment is meeting or moving towards desired conditions based on ratings from three representative pastures. There are some concerns about the amount of bare ground scattered throughout the allotment (created by high intensity wildfire in 2000), but no visible erosion has been noted, and there has been progress towards less bare soil since 2005. Concern regarding the amount of noxious weeds in one of the representative pastures was noted in 2005, but their presence was markedly reduced by 2009. Livestock stocking rates have been compatible with big game winter range objectives. A fourth pasture (Yount) is rated as “Not Meeting Desired Conditions,” where site production is noticeably less than adjacent pastures and plant diversity is low. These conditions are likely due to year-round use by livestock while in private ownership. The Forest Service acquired this parcel in the 1980s, and has been attempting to restore it by limiting prescribed use under a deferred rotation system.

There are no flowing streams or significant riparian areas in this allotment. The four small riparian areas associated with spring sources are generally protected from livestock use by fencing. Existing

fences excluding livestock from North Antelope Spring, The Seeps, and Wells Spring required to be reconstructed under this alternative to provide better protection of riparian resources. Enlarged fences would not be constructed in Alternative B at these three spring sites to increase the size of the riparian area protected from livestock trampling.

Alternative B would continue resting the Yount Pasture, as needed, to improve productivity and plant diversity. Representative montane grasslands in good condition are recognized and livestock use would not be intensified in those communities (Marriot 2000).

Alternative B would move toward or meet desired resource conditions on the Porcupine Allotment. The diverse HM Team would continue to review allotment progress, plan annual use numbers, and specific treatment objectives. Alternative B would not provide the same level of flexibility as Alternative C, because it does not include any new range improvements that may be used to improve resource conditions or the overall operation. No reduction in actual use is expected under this alternative.

Alternative C

Alternative C incorporates all the provision of Alternative B. Alternative C also contains a number of structural improvements that would provide additional riparian resource protection, and flexibility in meeting HM objectives. Required improvements include constructing larger riparian exclosures at North Antelope Spring, Wells Spring, and The Seeps. Construction of approximately 1.75 miles of new pasture boundary fence would be required to better control livestock and regulate animal impact in the Babbington-South Wolf 1 Pasture. Alternative C also requires installation of new water storage and watering tanks in the northeast side of the Wildcat-North 1 Pasture, and approximately 0.75 miles of new pipeline would be extended from the Babbington Pasture to the new water tanks.

These structures would provide additional resource protection and allow better utilization of the allotment. Numerous adaptive options for new structural improvements are also included in this alternative (See Chapter 2 description of alternatives). These adaptive options might not ever be constructed, but if they were it would also provide additional resource protection and flexibility in managing the HM operation.

Alternative C would maintain or moved toward desired resource conditions on the Porcupine Allotment more so than Alternative B since HM is continually enhanced with additional developmental measures. The diverse HM Team would continue to review allotment progress, plan annual use numbers, and specific treatment objectives. No reduction in actual use is expected under this alternative. Specific structural improvements and ongoing collaboration with the HM Team may facilitate additional livestock grazing use on this allotment.

Up to 5,300 acres may be prescribed burned over time to increase forage/browse production and reduce fuel loading from dead and downed pine trees. These burns may not occur unless funding is secured. Such burns would reduce the threat to structural improvements and young aspen regeneration, and also provide increased plant diversity and forage/browse production from new growth.

Redfern Allotment

Alternative B

The current 11,573 acres Redfern Allotment utilizes a four pasture deferred rotation system with a round-up pasture. The allotment is grazed from 06/11 to 10/25, currently using 195 cow/calf pairs at approximately 1,159 AUMs. The allotment may be overstocked by approximately 28% of the current 195 permitted livestock numbers (about 43 mature cattle) or about 31 days, for Alternative B, based on capability grazing modeling. Recent utilization studies (short-term monitoring) suggest it may be even higher than 28%. The total permitted use under Alternative B would be the equivalent of 177 cow/calf pairs, down from 195 due to a recent permit waiver. The remaining 18 permitted cattle were not waived, so those 18 will not be re-issued at this time. There is a concern that forage is limiting on this allotment, and benchmark trends are not meeting or moving towards desired conditions. This is probably because the conifers replanted after the 1939 McVey Fire have encroached and steadily reduced forage production.

Overall, the condition and trend of upland vegetation does "Not Meet Desired Conditions," as represented by a transect in the White Earth Pasture. A diverse mix of grasses and forbs are present with some snowberry, but Canada thistle is present and native grasses are not dominant. Smooth brome is not as dominant as it appears in other allotments. Bare ground does not appear to be an issue, but Canada thistle and leafy spurge are present throughout the allotment in varying densities. The lesser rating of desired conditions is due to an increase in noxious weed infestations and past levels of overutilization which has affected plant vitality. There are also concerns that allocated forage for wintering wildlife is being compromised by overuse of primary rangelands by livestock.

Upland vegetation conditions would be expected to begin slowly moving towards desired conditions under Alternative B by moving livestock before exceeding the 50% utilization by weight standard. Use of IPM techniques would continue reducing noxious weed infestations resulting from past overuse, and those spaced would be filled in by native and non-native grasses, forbs, and some shrubs over time. Compliance with this requirement would also limit repeated use of forage regrowth, which would result in improved plant vigor and abundance.

Reducing allotment actual use to grazing capacity based on monitoring data would allow uplands to be grazed and not overused each season. The likely outcome is actual grazing use would be reduced. This may result in decreases in actual livestock use by approximately five days in Slate Creek Pasture, three days in the White Earth Pasture, four days in the Nugget Pasture, and six days in the Queen Bee Pasture. If these measures do not continue to show progress towards desired conditions, the most likely adaptive option may be to further decrease days of use in that pasture, and/or the allowable proper use by weight may also be adjusted to 45% for upland vegetation.

Riparian conditions in the Slate Creek Pasture are rated as "Moving towards Desired Conditions." Kentucky bluegrass is the dominant vegetation but some riparian species are also present, although the percentage of hydric plant species is below the desired threshold level. Streambank stability is at acceptable levels, but alteration ratings exceed threshold levels. The chief cause of the lesser rating is believed to be the length of time this pasture is grazed (36 days) which allows for repeated use of plant regrowth, and increased opportunity for hoof impact that results in streambank alteration and affects streambank stability.

Alternative B addresses the overall riparian conditions including Slate Creek by: 1) requiring reconstruction of two water sources in the middle of the Slate Creek Pasture intended to pull livestock away from the Slate Creek riparian area; and 2) through compliance with the four inch riparian stubble height requirements. Compliance with the riparian stubble height requirement should improve streambank alteration ratings short term, and the percentage of hydric plant species are expected to improve over the long term. The likely effect of meeting the four inch riparian stubble height requirement is that actual livestock days of use may be further reduced. This may result in additional decreases in actual livestock use by approximately 11 days in the Slate Creek Pasture, three days in the White Earth Pasture, four days in the Nugget Pasture, and 19 days in the Queen Bee Pasture.

Implementation and effectiveness monitoring should help determine the appropriate livestock grazing use levels. If no or inadequate improvement in riparian conditions occurs by following four inch riparian stubble height requirement, the residual stubble height for riparian vegetation may be adjusted to six inches. If days of livestock use are reduced to meet capacity and riparian requirements, it is unlikely this time could be made up in whole or part in other pastures due to overstocking and capacity issues. Ongoing timber thinning and harvest may make additional forage available on this allotment, but this is unlikely to substantially offset this loss in actual use since much is on ungrazeable terrain. Additional forage would promote better distribution of remaining livestock and use by big game use.

The overall outcome is actual grazing use for this allotment would be less than currently allowed. The amount of reduction in actual use for Alternative B may be greater than for Alternative C since the riparian threshold of four inch stubble height would be reached before the upland trigger is exceeded. Actual grazing use reductions may range from approximately 18 to 55 days.

Overall, riparian and upland conditions are expected to begin or continue moving towards desired conditions under Alternative B. The improvement in riparian conditions would be less than that expected in Alternative C where Slate Creek is fenced and grazing use reduced to four days from the current 36 days.

Alternative C

Alternative C incorporates all provisions of Alternative B. It also would maintain existing improvements and reconstruct or remove structural improvements as presented in Alternative B.

Alternative C addresses the riparian issue in the Slate Creek Pasture by requiring reconstruction and/or relocation of two water developments to better distribute livestock, construction of approximately 1.5 miles of new fence along FSR 530 south of Slate Creek Dam, and installation of one cattleguard in FSR 530.1C where the fence would cross the road. This fence would exclude livestock use on the Slate Creek Pasture on approximately one mile of the Slate Creek riparian area. The newly fenced out portion would be combined with the Redfern Holding Pasture and collectively grazed approximately four days per season. This reduction in use from 36 days now grazed in the Slate Creek Pasture, to four days with the newly combined Redfern Holding Pasture, would substantially improve Slate Creek riparian conditions.

The riparian and overstocking issues are addressed the same as for Alternative B - through a likely reduction in actual grazing use ranging from approximately 18 to 44 days based on

capability modeling, or possibly even more as a result of monitoring. As with Alternative B, ongoing timber thinning and harvest may make additional forage available on this allotment, but this is unlikely to substantially offset this loss in actual use.

Overall, riparian and upland conditions are expected to begin or continue moving towards desired conditions under Alternative C. The improvement in riparian conditions would be greater than that expected in Alternative B, where Slate Creek is not fenced.

Rimmer Allotment

Alternative B

The Rimmer Allotment includes 2,011 acres split between two pastures operating from June 11 to October 10, currently using 33 cow/calf pairs and approximately 175 AUMs. There are no grazing capacity issues with this allotment based on capability modeling.

Alternative B would modify the allotment by incorporating the underutilized West School Pasture from the Slate Prairie Allotment into the Rimmer Allotment to form a third pasture. This new pasture would accommodate reduction to the long duration grazing in the Rimmer Pasture by 10 days, and reducing days of use in the Grandad Pasture by four days. Under Alternative B, required actions include reconstruction of the spring exclosure at Lost Park Spring to protect the associated riparian area from livestock, and two gates on Trail 40 would be repaired to facilitate livestock control.

The condition and trend of upland vegetation, represented by transects in the Rimmer Pasture, does "Not Meet Desired Conditions." The current duration of grazing use is long in this pasture (88 days), resulting in some grazed areas exceeding proper allowable use, and the percentage of bare ground to exceed threshold levels. Plant regrowth is subject to repeated grazing use, which also can compact the soils and reduces plant vitality. Condition and trend of upland vegetation in the Grandad Pasture was rated as "Meeting Desired Conditions." This small pasture is grazed for 34 days, and it appears livestock spend considerable time on adjacent private land, hence lessening impact to the Grandad Pasture.

Upland vegetation conditions would be expected to be maintained in the Grandad Pasture, and begin moving slowly toward desired resource conditions in the Rimmer Pasture under Alternative B. The addition of a new pasture and reduction in days of grazing use in the existing pastures is expected to result in more even utilization of upland vegetation. In addition, compliance with the 50% upland utilization by weight requirement would also be expected to improve upland vegetation conditions.

Riparian conditions in the Rimmer Pasture are rated as "Not Meeting Desired Conditions." Kentucky bluegrass is the dominant species, and riparian vegetation is very limited. Streambank stability is at acceptable levels, but streambank alteration exceeds threshold level. The percentage of hydric plant species is well below desired threshold levels. The primary cause of these conditions is believed to be the length of time this pasture is grazed.

Overall, riparian conditions are expected to improve and begin moving towards desired conditions under Alternative B by moving livestock before the new four inch riparian stubble height requirement is exceeded. The likely effect of meeting the four inch riparian stubble height

requirement is that actual livestock days of use may be reduced. Compliance with this requirement is expected to maintain streambank stability, improve streambank alteration short term, and increase the percentage of hydric plant species over the long term. Compliance with the riparian stubble height requirement and the 50% upland utilization by weight requirement is also expected to limit repeated grazing of forage regrowth, which would result in improved plant vigor and abundance.

Implementation and effectiveness monitoring should help determine the appropriate livestock grazing use levels for the Rimmer Pasture. The likely effect of meeting the four inch riparian stubble height requirement is that actual grazing use in the Rimmer Pasture may be less than 78 days. If no or inadequate improvement in upland and riparian conditions occurs by following the four inch riparian stubble height and the 50% upland utilization requirements, the allowable proper use may also be adjusted to 45% for upland vegetation, and the residual stubble height for riparian vegetation may be adjusted to six inches. If days of livestock use are reduced in the Rimmer Pasture, it is unlikely this time could be made up in other pastures because there is no excess capacity.

Alternative C

Alternative C incorporates all the provisions of Alternative B, including changes in pastures and a slight increase in size for the Rimmer Allotment by adding the West School Pasture.

Adaptive options available in Alternative C would provide some additional flexibility in addressing resource concerns, such as increasing the size of West School Pasture by approximately 120 acres by incorporating a portion of the Slate School Pasture currently in the Slate Prairie Allotment. Installation of a new cattleguard and reconstruction of an existing water development would be needed to implement this option. There is also an option to construct approximately 1.75 miles of new fencing in the Rimmer Pasture to control livestock. An additional adaptive option is to construct approximately 0.60 mile of new fence, install a cattleguard, and reconstruct access to a water source to create a fourth pasture (named “187”), which would split off approximately 500 acres from the Rimmer Pasture.

There could be a reduction in actual grazing use in order to meet desired upland and riparian conditions, but the likely outcome is that actual use on the Rimmer Allotment would be close to the current allowed use. The additional flexibility offered by Alternative C would make a reduction in actual use less likely than for Alternative B. Overall, riparian and upland conditions are expected to improve under Alternative C, similar to Alternative B.

Slate Prairie Allotment

Alternative B

The 5,896 acre allotment is managed using a five pasture deferred rotation system from 06/01 to 10/20 currently using 200 mature cattle (cow/calf) at approximately 1,232 AUMs. Capacity modeling indicates the allotment is overstocked by approximately 15% (26 mature cattle) or roughly 20 days. Recent utilization studies (short-term monitoring) suggest it may be 30% or higher.

Alternative B would modify current management by removing the West Slate School Pasture and adding it to the existing Rimmer Allotment since it is underutilized by Slate Prairie permitted livestock, and always grazed late in season. Use with the Rimmer Allotment (same permittee) would

allow for variation in season of use. This change would reduce the Slate Prairie Allotment by one pasture (77 acres and two days of use), resulting in a four pasture deferred rotation grazing system.

Condition and trend of upland vegetation in the Slate Prairie Allotment does "Not Meet Desired Conditions," as represented by transects in the Mystic and Whitetail Pastures. Vegetation conditions are believed to be a result of grazed areas repeatedly exceeding proper allowable use, which is adversely affecting plant vitality. In some areas, bare ground is exceeding threshold levels and plant spacing appears to be increasing. In general, there is a wide variety of grasses and forbs throughout the allotment, although the grass component is dominated by non-native Kentucky bluegrass, smooth brome, and timothy. Noxious weed infestations, primarily Canada thistle and leafy spurge, are also of concern.

Upland vegetation conditions would be expected to begin slowly moving towards desired conditions under Alternative B. Compliance with the 50% upland utilization by weight requirement, along with ongoing use of IPM techniques to reduce noxious weed infestations, would be expected to gradually improve upland vegetation conditions. Reducing allotment actual use to grazing capacity based on monitoring results would allow uplands to be grazed and not overused each season. The likely outcome is actual grazing use would be reduced. This may result in a decrease in actual livestock use by approximately four days in the Mystic Pasture, seven days in the Whitetail Pasture, five days in the Hay Draw Pasture, and four days in the Slate School Pasture. If no or inadequate improvement occurs, the most likely adaptive option may be to decrease the allowable use percentage by weight to 45%.

Riparian conditions in the Mystic Pasture are rated as "Not Meeting Desired Conditions." Nebraska sedge and smooth brome are dominant species, and the percentage of hydric plants is below the desired threshold level. Streambank alteration is high and exceeds threshold levels, and streambank stability ratings are less than the desired threshold. It is believed that the duration of use by livestock is too long and such use continues to prevent this portion of Slate Creek from recovering from such impacts.

Riparian conditions in the Whitetail pasture are also rated as "Not Meeting Desired Conditions." Kentucky bluegrass is the dominant species, riparian vegetation is not as abundant as it should be, and the percentage of hydric plant species is below desired threshold levels. Streambanks are rated high for stability, although streambank alteration exceeds desired threshold levels. Similar to the Mystic Pasture, it is believed that the duration of use is preventing remnant riparian species from re-colonizing the site.

Alternative B addresses riparian concerns by requiring: 1) compliance with the four inch riparian stubble height requirement; 2) reconstruction of two spring exclosures to protect from livestock trampling in the Mystic and Whitetail Pastures; 3) reconstruction of about 0.20 miles of drift fence at the junction of Crooked Creek and Castle Creek in the Whitetail Pasture; and 4) adding rock to the pond spillway in the Slate School Pasture. These measures would have a modest effect on improving riparian conditions. The likely effect of meeting the four inch riparian stubble height requirement is that actual livestock days of use may be further reduced. This may result in additional decreases in actual livestock use by approximately six days in the Mystic Pasture, 25 days in the Whitetail Pasture, and 14 days in the Hay Draw Pasture. If no or inadequate improvement occurs, the most likely adaptive option may be to increase the riparian stubble height to six inches.

Implementation and effectiveness monitoring of riparian and upland conditions should help determine the effectiveness of the above actions. These measures would be expected to improve streambank alteration ratings short term, streambank stability, the percentage of hydric plant species, and the extent of riparian vegetation should improve over the long term. Compliance with the upland utilization by weight standard and riparian stubble height requirement would also limit repeated use of forage regrowth, which would result in improved plant vigor, health, and abundance.

The likely outcome is that overall allotment actual grazing use would be less than the currently allowed use, less livestock may graze, or a combination of the two. The possible reductions in actual grazing use may range from 20 to 66 days, and would not be made up in other pastures since the allotment is already considered overstocked and no additional capacity exists. These reduced days of use result from adherence to upland and riparian requirements.

Alternative C

This alternative would incorporate the same changes in pastures and slight reduction in size for the Slate Prairie Allotment as proposed in Alternative B. It would also complete the same reconstruction of needed improvements and removal of unneeded improvements.

Alternative C requires construction of a new exclosure fence to protect a fen in the Whitetail Pasture. No other required structural improvements that would reduce riparian or upland effects or address the overstocking issue are proposed in this alternative. It also contains potential adaptive options to develop a spring and construct up to half a mile of drift fence in the Whitetail Pasture, enlarge the exclosure fence at Daugherty Spring in the Hay Draw Pasture, and construct an exclosure fence around a pond, install water pipe and tank in the Slate School Pasture. Although these adaptive options are available, the basic problem is overstocking rather than distribution, so additional structures would only offer marginal improvement. The enlarged exclosure Daugherty Spring may allow some current days of use to be retained in Hay Draw Pasture when compared to Alternative B.

The likely outcome is that actual grazing use would be less than the currently allowed use, less livestock are allowed to graze, or a combination of the two. This is similar to Alternative B.

Tigerville Allotment

Alternative B

The existing 5,825 acre allotment is managed using a seven pasture deferred rotation system from 06/01 to 10/25 currently using 112 mature cattle (cow/calf) at approximately 715 AUMs.

Alternative B would modify this by combining the West Side and Lena Pastures, resulting in six pastures. The allotment appears to have adequate grazing capacity for the current level of use. The condition and trend of upland vegetation is represented by transects in the Lena and Redfern Pastures. The Lena transect is rated as “Moving towards Desired Conditions;” a good diversity of species is present, and bare ground is minimal. The Redfern transect is rated as “Not Meeting Desired Conditions,” likely because utilization the past three years exceeded proper allowable use, resulting in increased bare ground and reduced plant vitality. In general, upland vegetation in the allotment contains a wide variety of grasses and forbs, although the grass component is dominated by non-native Kentucky bluegrass and smooth brome. Bare ground and noxious

weeds are not a concern at this time.

Alternative B addresses upland conditions by strictly following the 50% proper allowable use by weight standard. Upland vegetation conditions would be expected to begin moving slowly toward, or continue moving toward desired conditions. Over time, bare ground would be expected to decrease, and plant vigor and abundance would be expected to increase.

Riparian conditions in the Mini Pasture are rated as "Not Meeting Desired Conditions." Although streambank stability is at acceptable levels, willows are overused, hummocks are present, streambank alteration exceeds desired thresholds, and the percentage of hydric plant species is below the desired threshold. These conditions may be the result of repeated use as a watering location for both the Redfern and Tigerville Pastures.

Alternative B addresses riparian conditions in the Mini Pasture by: 1) only grazing once a year with either the Tigerville or Redfern Pasture for approximately 20 days or less; and 2) following the new four inch riparian stubble height requirement. These measures would be expected to improve streambank alteration in the short term, improve willow health, and improve the percentage of hydric plant species in the long term. If no progress in reversing trend and moving toward desired conditions is achieved in the Mini Pasture, then the most probable adaptive action may be to adjust the allowable proper use to 45%, and/or increasing the riparian stubble height to six inches

Alternative B address riparian conditions in the remainder of the allotment by requiring: 1) adherence with the new four inch riparian stubble height requirement; 2) reconstruction of the existing spring exclosure fence in the northeast corner of the Tigerville Pasture; and 3) armoring with rock and gravel an existing water point access to Slate Creek in the Deer Park Pasture. Overall, riparian conditions are expected to improve under Alternative B. The likely effect of meeting the four inch riparian stubble height requirement is that actual livestock days of use may be reduced.

Implementation and effectiveness monitoring of riparian and upland conditions should help determine the effectiveness of the above actions. Minor adjustments in actual grazing use days may be needed to ensure each pasture meets desired resource conditions. Any reduction in other pastures could likely be made up in the Deer Park Pasture due to recent timber sale and fuels reduction work creating new primary and secondary range. Timber sale activity is also on-going in the Redfern Pasture.

Alternative C

Alternative C incorporates all the provisions of Alternative B. Alternative C requires construction of a larger exclosure at a spring in the Tigerville Pasture. A possible adaptive option in this alternative includes constructing approximately one-third mile of fence to incorporate a portion of the adjacent Newton Fork Allotment. This would increase the size of the Mini Pasture by approximately 80 acres by incorporating an unused 80 acre portion of the Newton Fork Allotment. Alternative C would complete the same reconstruction of needed improvements.

Possible adaptive options included in Alternative C to provide additional resource protection include construction of fence exclosures around breeched beaver dams and willow remnants in the Westside Pasture, and around a fen in the Deer Park Pasture.

As with Alternative B, implementation and effectiveness monitoring of riparian and upland conditions should help determine the effectiveness of Alternative C. Overall, riparian and upland conditions are expected to improve under Alternative C, quite similar to Alternative B. If the two exclosure fences are constructed, Alternative C would provide increased protection of riparian resources at those two sites.

Cumulative Effects for all Allotments

Alternative B

Cumulative effects were analyzed for the project area consisting of the Bald Horse, Deerfield, Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville Allotments. The spatial boundary and timeframe is the same as Alternative A – No Action.

Adjacent private lands would continue to have the same effects on the allotments as described for Alternative A. Private in-holdings within or adjacent to Mystic Range Project allotments may not have private land line fencing so permitted livestock may enter, graze, or pass through these properties. The opportunity for incidental unauthorized use by privately owned livestock, not permitted to graze, occur, as well as an increase may occur over time as more private lands are developed for housing and stabling of horses. The observed trend over the past twenty years is increasing rural development, more people living in or near allotments, and more conflicts with permitted grazing over the lack of fencing and presence of forest livestock on private lands.

Recreation would continue to have the same effects on the allotments as described for Alternative A. Recreation can have adverse effects on range conditions and livestock grazing. Population growth in and around the project area has led to greater numbers of forest users. These uses would continue to conflict with permitted grazing and many issues such as gates left open (livestock in wrong pastures), damage to structural improvements, and harassment of livestock and operators is expected to increase as more users frequent the National Forest. There may be some mitigation by restricting users to designated routes and installing trail cattleguards with implementation of the 2010 travel management plan for the Forest.

Livestock grazing can and has reduced fine fuel loadings which helps prevent ignitions or lessens spread of new starts. The exclusion of wildfire would continue to have the same effects on the allotments as described for Alternative A.

Prescribed fire projects approved from other NEPA documents would have a direct short-term impact on permittees and livestock grazing since the allotment use is deferred or rested following execution of a burn. There would be a need to plan sufficient recovery time in burned areas according to the Forest Plan (FP guideline 4107). Both wildfire and prescribed fire would continue to have short-term adverse effects on range conditions but over the long-term effects are expected to be beneficial as noted in Alternative A.

Past and future timber harvest and prescribed fire have created and would continue to create transitory or secondary range under Alternative B. These timber sales and related activities are listed in the Appendix C. Cumulative effects are the same as described in Alternative A. There has been a trend towards whole tree removal (POL, saw log, and thinning), which concentrates slash for burning or chip and removal off site. These practices are preferred as lop and scatter in

the forest concentrates slash over forage and browse production, making livestock and even big game access difficult. Power lines and other utility corridors may increase livestock distribution because routes are opened through forested areas and roads are constructed for machinery access.

Access areas to the Spring Creek watershed (TMDL) are not fenced off for the Palmer, Keystone, and Samalias Pastures in the Palmer Gulch Allotment. Other Forest Service allotments (outside of the Mystic Range Project) within the Spring Creek study area may continue to contribute to the TMDL, unless additional mitigation or design criteria are implemented. See Hydrologist Specialist report for more details.

Livestock would continue to enter the Deerfield Recreation Area and developed sites in the Lake Shore Pasture since no new fences would be constructed. Such grazing use would still occur after Labor Day which minimizes conflicts with site users.

Noxious weeds would continue to be treated IPM approached throughout the project area, contingent again on funding. Ground disturbance due to livestock grazing practices occurs at salt grounds and watering facilities, and would continue with permitted grazing. Expected effects as described in Alternative A would still occur with Alternative B.

Big game animals, especially elk and deer, would continue to have an effect on herbaceous vegetation as noted in Alternative A. In the future, with grazing as a disturbance agent, it is anticipated that the overall amount of forage and browse would remain constant as forage remains stimulated by livestock use and does not become thatched. As noted previously, timber sale activities are planned to open up dense pine stands and this action would release a new crop of forage and browse which should persist in declining amounts until the canopy closure equals 35%.

As noted in Alternative A, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These vegetative treatments will increase forage and browse production for wildlife.

High numbers of big game animals, especially elk and deer, have a significant effect on herbaceous vegetation. The dietary overlap between elk and livestock is similar (Zimmerman, 2004) (Beck and Peek, 2005). Grazing management of forage by the Forest Service takes wildlife grazing use into consideration. Allowable use standards are designed to provide adequate forage and habitat needs for various wildlife species. If allowable use standards are reached due to the combined utilization of forage by livestock and wildlife; livestock are moved to the next grazing unit or removed from the allotment. Management of big game numbers is under the control of South Dakota Game, Fish and Parks.

The South Dakota Game, Fish, and Parks Department recently purchased Cooper Ranch roughly centered within the Porcupine Allotment. The parcel includes several large open meadows, a well, cabin, and handling facilities for livestock. The State intends to manage the property as a Game Production Area. This purchase appears to have stabilized this tract's contribution to the management of the Porcupine Allotment. This area serves as a temporary base for the permittee during the grazing season, and supplied well water to the water storage tanks on the allotment. Currently, the permittee uses an annual lease to secure use.

The end purpose for adaptations of forest and range ecosystems is to make adjustments in management that ideally reduce the negative impacts of climate change, and take advantage of any positive impacts (Blate, 2009). Some impacts that may occur in the project area are longer, warmer growing seasons, shifts in the seasonality of hydrological flows, intense droughts, increased erosion events in impaired watersheds, increased stream temperatures, and socio-economic impacts to the permittees and related communities with stresses from lack of grazing or reduced grazing opportunities. Without use of "Adaptive Management," it would be more difficult to respond to the alterations brought on by climate change. Actions taken would tend to be more of a reactive approach based on some condition, rather than proactive action taken ahead of a more stressful event or events. The end result is one less tool in the portfolio or toolbox of strategies to mitigate issues for permitted livestock grazing.

Alternative C

Cumulative effects were analyzed for the project area consisting of the Bald Horse, Deerfield, Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville Allotments. The spatial boundary and timeframe is the same as Alternative A and B.

Adjacent private lands would continue to have the same effects on the allotments as described for Alternative B. The observed trend over the past twenty years is increasing rural development, more people living in or near allotments, and more conflicts with permitted grazing over the lack of fencing and presence of forest livestock on private lands.

Recreation would continue to have the same effects on the allotments as described for Alternative B. These uses would continue to conflict with permitted grazing. The Spring Creek Trailhead and adjacent riparian area would no longer be impacted by livestock with the construction of a highway ROW fence along the north side of Sheridan Lake Road. The recreation sites on the south side of Deerfield Reservoir (Whitetail Campground, day use areas, and Gold Run Parking Lot) would no long be impacted by fall cattle grazing after completion of the Deerfield Highway ROW fence.

Livestock grazing can and would continue to reduce fine fuel loadings which helps prevent ignitions or lessens spread of new starts. The exclusion of wildfire would continue to have the same effects on the allotments as described for Alternative B.

Prescribed fire would continue have a direct short-term impact on permittees and livestock grazing since the allotment use is deferred or rested following execution of a burn. Should funding for the adaptive option of additional prescribed burning for the Porcupine Allotment be secured, fuels reduction would occur, and livestock and big game benefit from additional forage and browse production. There would still be a need to plan sufficient recovery time in burned areas according to the Forest Plan (FP guideline 4107). Both wildfire and prescribed fire would continue to have short-term adverse effects on range conditions, but over the long-term effects are expected to be beneficial as noted in Alternative A and B.

Past and future timber harvest and prescribed fire have created and would continue to create transitory or secondary range under Alternative C. These timber sales and related activities are listed in the Appendix C. Cumulative effects are the same as described in Alternative B.

Noxious weeds would continue to be treated with IPM approach throughout the project area, contingent on funding. Ground disturbance due to livestock grazing practices occurs at salt grounds and watering facilities, and would continue with permitted grazing. Expected effects as described in Alternative A and B would still occur with Alternative C.

As with Alternative B, access areas to the Spring Creek watershed (TMDL) are not fenced off for the Palmer Pasture. Alternative C requires fencing on the Keystone and Samalias Pastures. Other Forest Service allotments (outside of the Mystic Range Project) within the Spring Creek study area may continue to contribute to the TMDL unless additional mitigation or design criteria are implemented. See Watershed, Geology, and Soils Section for more details.

Livestock would no longer access the Deerfield Recreation Area (Lake Shore Pasture) since the highway ROW would be fenced. Grazing use would no longer occur which minimizes conflicts with site users. Livestock would no longer access Spring Creek along Sheridan Lake Road since the highway ROW would be fenced.

Big game animals, especially elk and deer, would continue to have an effect on herbaceous vegetation, as noted in Alternative B. In the future, with grazing as a disturbance agent, it is anticipated that the overall amount of forage and browse would remain constant as forage remains stimulated by livestock use and does not become thatched.

As noted in Alternative B, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These vegetative treatments would increase forage and browse production for wildlife and livestock.

High numbers of big game animals, especially elk and deer, have a significant effect on herbaceous vegetation. The dietary overlap between elk and livestock is similar (Zimmerman, 2004) (Beck and Peek, 2005). Grazing management of forage by the Forest Service takes wildlife grazing use into consideration. Allowable use standards are designed to provide adequate forage and habitat needs for various wildlife species. If allowable use standards are reached due to the combined utilization of forage by livestock and wildlife; livestock are moved to the next grazing unit or removed from the allotment. Management of big game elk numbers is under the control of South Dakota Game, Fish and Parks.

Recently the South Dakota Game, Fish and Parks Department completed a purchase of the private land parcel within the Porcupine Allotment, and intends to manage it as a Game Production Area. The parcel includes several large open meadows, a well, cabin, and handling facilities for livestock. There new owner desires an effective working relationship with the permittee, so it appears no adverse changes in the tract's contribution to the management of the Porcupine Allotment. This parcel serves as a temporary base for the permittee during the grazing season, and supplied well water to the water storage tanks on the allotment.

The end purpose for adaptations of forest and range ecosystems is to make adjustments in management that ideally reduce the negative impacts of climate change, and take advantage of any positive impacts (Blate, 2009). Some impacts that may occur in the project area are longer, warmer growing seasons, shifts in the seasonality of hydrological flows, intense droughts,

increased erosion events in impaired watersheds, increased stream temperatures, and socio-economic impacts to the permittees and related communities with stresses from lack of grazing or reduced grazing opportunities. With the use of "Adaptive Management," it would be easier to respond to the changes brought on by climate change. Actions taken would tend to be more of a proactive approach based on some condition, rather than reactive respond taken ahead of a more stressful event or events. The end result is one more tool in the portfolio or toolbox of strategies for permitted livestock grazing.

WILDLIFE HABITAT

Introduction

This report documents what is currently known regarding wildlife and habitat resources in the Mystic Range Project area on Mystic Ranger District and analyzes the potential effects of three alternatives on eight grazing allotments to Management Indicator Species (MIS) and Species of Local Concern (SOLC). Data were collected and compiled from field surveys (2007-2009), District wildlife observation data, South Dakota Natural Heritage Program (SDGF&P 2008a), literature reviews, communication with District personnel, and the Wildlife Report completed for the Phase II Amendment to the Black Hills National Forest Land and Resource Management Plan Revision (USDA Forest Service 2005a, Appendix C).

The goals and objectives for the Mystic Range Project area for the wildlife resource are to provide for a variety of life through the management of a biologically diverse landscape. These goals and objectives, along with the Black Hills National Forest Land and Resource Management Plan (hereafter Forest Plan) and Standards and Guidelines as amended by Phase II, would provide and maintain an appropriate mix and balance of habitats over the long term. This diversity would provide habitats to maintain populations of all vertebrate and invertebrate wildlife and plant species in the area, and would not result in any individual species trending toward or becoming listed as threatened or endangered. The area would provide for a variety of wildlife recreational opportunities, ranging from consumptive to non-consumptive activities (e.g. hunting to wildlife viewing).

This document tiers directly to the revised Forest Plan and the Phase II Forest Plan Amendment EIS (USDA Forest Service 1996b, 2005a) and the associated Biological Assessment/ Biological Evaluations (BA/BE), (Appendices H and C respectively). The Forest Plan, as amended, provides direction on how grazing should be managed to comply with laws, regulations and policy. The actions proposed would ensure that grazing management is in compliance with Forest Plan goals, objectives, standards, and guidelines, and any other applicable laws, regulations and policies.

Pre-Field Review and Field Reconnaissance

The pre-field review was completed using field surveys, district records, literature reviews, on-line databases, the South Dakota Natural Heritage Database (South Dakota Department of Game, Fish, and Parks 2008a), South Dakota Game, Fish and Parks big game information (South Dakota Department of Game, Fish, and Parks 2008b), and the Forest Plan Monitoring Report (USDA Forest Service 2008a, 2009a). Publications based on fieldwork performed in the Black Hills (e.g., Turner 1974, Peterson 1995, Tigner and Aney 1994, Frest and Johannes 2002), the Expert Interview Summary for the Black Hills National Forest Plan Phase I, Species Conservation Assessments, and

current research documents were also used. Data and results of all surveys performed in the area can be found in the Mystic Range Project file.

Field reconnaissance of the Mystic Range Project Area was completed during the summers of 2004 through 2009. Field visits were performed with intent to identify suitable and/or occupied habitat for R2 sensitive species and to determine the effects of current livestock use on wildlife and their habitats. Several Frest and Johannes (2002) snail survey sites and known snail colonies are located near or within the Mystic Range Project allotments, along with several forest bird and butterfly monitoring transects (Rocky Mountain Bird Observatory 2001-2009, Marrone 2002, 2005, 2006, 2007).

Analysis of Effects

The analysis of direct and indirect effects for wildlife species focuses on Management Indicator Species (MIS), Species of Local Concern, (SOLC) and R2 Sensitive species (See MRP Biological Evaluation), their habitat needs and their prey species availability as it relates to livestock grazing and associated rangeland improvements (e.g. prescribed burning, riparian improvement) and range structural improvements (e.g., fences, water developments, cattleguards). Fragmentation and connectivity of habitat communities as it relates to MIS species were analyzed as part of the Forest Plan EIS (USDA Forest Service 1996b), and analyzed in relation to SOLC species in the Phase II EIS (USDA Forest Service 2005a). The best available science for each species was taken in to account, which may include additional information and referencing (e.g., conservation assessments).

The cumulative effects analysis area for wildlife species are geographically bounded by the project area boundary (including private lands). This was chosen because it is significantly larger than the home ranges of most wildlife residing in the Mystic Range Project Area, excluding migrations that occur outside of the Black Hills National Forest. For deer and elk, geographic bounding includes migratory routes and winter ranges. The temporal bounding of cumulative effects evaluated varies among activities, but for the purposes of this document the temporal bounding is from 1970 and up to 15-20 years future. This range accommodates the period from the oldest allotment management planning period (1969) to a time in which actions are reasonably foreseeable. Activities evaluated are those most relevant to the area and to the species, and include fire suppression, fire occurrence, vegetative treatment (e.g., timber harvest, fuel treatments), prescribed burning, land development, and roads. With the notable exception of land development, all of the activities occur on both public and private lands. The wildlife analysis is dependent on and/or complimentary to other specialist reports (e.g., hydrology, range) for the Mystic Range Project EIS. The 1997 Forest Plan FEIS (USDA Forest Service 1996b) and the Phase II FEIS (USDA Forest Service 2005a) addresses cumulative effects of Forest management at the eco-regional (Black Hills) scale; please see that document for effects appropriate to that scale.

Management Indicator Species (MIS)

Management Indicator Species (MIS) are species that represent a suite of wildlife and fish species and their habitats. MIS are evaluated based on observations and/or presence of suitable habitat within the Mystic Range Project's eight allotments. The Phase II Amendment FEIS (USDA Forest Service 2005a; Sec 3-3.3.6 through Sec 3-3.3.8.2) provides in-depth information (i.e., range, distribution etc.) for each MIS selected for analysis. The Mystic Range Project analysis for MIS is tiered to that document and to the 1997 Forest Plan FEIS (USDA Forest Service 1996b).

Information from these documents is summarized for each MIS. Table 3-3 identifies MIS species selected for analysis for the Mystic Range Project, and reasons for their Forest Plan designation (USDA Forest Service 2005a).

Table 3-3 Summary of Forest Plan MIS, their status, and habitat these species represents.

Forest Plan MIS	Status[1]	Habitat Represented
Black-backed Woodpecker	R2	Mature and late successional forest, burned forest, insects, and snag conditions.
Brown Creeper	MIS	Late successional conifer forest, large trees, and snag conditions.
Golden-crowned Kinglet	MIS	Spruce forest, mostly mature and late-successional.
Beaver	MIS	Riparian/aquatic habitat conditions (hardwood forests and shrub component).
Song Sparrow	MIS	Riparian habitats.
Grasshopper Sparrow	R2	Prairie grassland.
Ruffed Grouse	MIS	Aspen quality and vigor in pure and mixed stands.
White-tailed Deer	MIS	Variety of forest conditions, including occurrence of understory shrubs.
Mountain Sucker	R2	Aquatic habitat condition and connectivity.

[1] R2 = Region 2 Sensitive. MIS = Management Indicator Species

The MIS analysis focuses on how the alternatives would influence the Forest-wide population trend (if available), the Forest-wide habitat trend, and attainment of Forest Plan Objective 238. Trend data for all species was obtained from the FY 2007 and or 2008 Forest Plan Monitoring and Evaluation Reports (FPMER) (USDA Forest Service 2008a, 2009b) unless otherwise indicated. Viability analysis has been completed at the Forest Plan level (USDA Forest Service 2005a), and therefore beyond the scope of this project level analysis. If the MIS species or suitable habitat does not occur in the project area, or if the species or its habitat is not affected by the Mystic Range Project, then it is excluded from further evaluation. If a species is known or suspected to occur in the project area or if suitable but unoccupied habitat is present or adjacent to the area; then the species has been evaluated with respect to effects of the proposed project activities (Table 3-4).

Table 3-4 MIS Species and Rationale for Mystic Range Project Analysis.

Species	Species/ Habitat Present?	Analyzed	Habitat Description
Black-backed woodpecker *(Picoides arcticus)*	Yes	Yes	Burned areas with a high density of pre-burn snags; dense and/or mature forests with a high snag density (Anderson 2003, Rocky Mountain Bird Observatory 2001-2009).
Brown creeper *(Certhia americana)*	Yes	Yes	In the Black Hills, white spruce and late successional pine appears to be the most important habitat type for this species (Wiggins 2005c, Rocky Mountain Bird Observatory 2001-2009).
Golden-crowned kinglet *(Regulus satrapa)*	Yes	Yes	Found almost exclusively in white spruce habitat but occasionally present in other habitats with a spruce component (Rocky Mountain Bird Observatory 2001-2009).

Species	Species/ Habitat Present?	Analyzed	Habitat Description
Beaver *(Castor canadensis)*	Yes	Yes	Large rivers and lakes down to streams, marshes and small lakes with seepage/weak flow adequate for damming and suitable woody vegetation (Boyle and Owens 2007).
Song sparrow *(Melospiza melodia)*	Yes	Yes	Streamside thickets, particularly shrubby willows, are required. Occasionally found in adjacent spruce habitat (Rocky Mountain Bird Observatory 2001-2009).
Grasshopper sparrow (*Ammodramus savannarum*)	Yes	Yes	Found almost exclusively in native mixed-grass prairies (Slater 2004, Rocky Mountain Bird Observatory 2001-2009).
Ruffed grouse *(Bonasa umbellus)*	Yes	Yes	Variable aged aspen stands, other hardwoods, and pine forests provide habitat. Winter habitat is almost exclusively aspen (Tallman et al. 2002, Wiggins 2006a).
White-tailed deer *(Odocoileus virginianus)*	Yes	Yes	Very adaptable species that can live in almost any habitat. In South Dakota, this includes grasslands, wetlands, and woodlands (USDA Forest Service 2005a).
Mountain sucker *(Catostomus platyrhynchus)*	Yes	Yes	See Fisheries Report.

Tree Nesting MIS Species:

The following species are dependent on trees for nesting, and are analyzed together in this section: black-backed woodpecker, brown creeper, and golden-crowned kinglet.

Black-backed woodpecker (*Picoides arcticus)*
The black-backed woodpecker has dual management status; it is both an MIS and a R2 sensitive species. To reduce redundancy, most life history, current condition, and predicted effects information are provided in the Mystic Range Project BA/BE. Only MIS-specific documentation requirements are provided here (e.g., trend information and analysis of Objective 238). Forest Plan vegetation objectives that apply to the black-backed woodpecker in the Mystic Range Project are 11.03, 211, 218, 221, and 238, 4.1-203, 5.1-204, and 5.4-206. These objectives relate to snags, pine structural stages, insects/fire, and maintenance of white spruce. Large trees are important habitat component for the black-backed woodpecker. Insect infested trees and large diameter snags provide foraging and nesting habitat.

Forest monitoring indicates that where large wildfires have occurred over the past decade, the species has been observed much more frequently and in higher densities. The Forest-wide relative density for this species is probably higher than “normal” given the current habitat conditions, because black-backed woodpecker populations are ‘eruptive” as reflected in their densities in burned habitat. This pattern of rapid colonization and subsequent decline is consistent with findings of other studies (Anderson 2003). The “aging” of large burned areas, such as the Jasper Fire, into habitat less suitable for black-backed woodpeckers is likely being offset by the increasing acreage of insect-infested timber stands and the stable acreage of large diameter, older pine trees (USDA Forest

Service 2009a). This species' Forest-wide population trend is also likely to decline in the future as vegetation management efforts to reduce the fire-hazard and insect-risk continue. Blakesly et al. (2008) projected it would take 25 years to detect a 3% annual decline for this species in burned habitats. Overall, habitat for this species is being provided across the Forest, consistent with Objective 238b, Objective 221 and Objective 11.03 (USDA Forest Service 2009a).

In the Black Hills, this woodpecker's distribution and abundance is closely associated with recent stand-replacing fires and insect outbreaks (Bonnot et al. 2009, Rocky Mountain Bird Observatory 2001- 2009). These conditions provide increased numbers of their main prey: larvae of wood-boring beetles, engraver beetles, and bark beetles (Saab et al. 2007).

the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These treatments are to enhance species diversity and improve habitat for selected focus species. The black-backed woodpecker is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). This species has been documented in all eight of the allotments. Livestock grazing, per se does not affect this species habitat or their prey species.

Brown creeper *(Certhia americana)*

The Forest vegetation objectives that most closely apply to the brown creeper in the Mystic Range Project are 211, 218, 238, 239-LVD, 4.1-203, 5.1-204, and 5.4-206, which relate to maintenance of snags, pine structural stages, very large trees, and white spruce.

In the Black Hills, the brown creeper is well distributed but low in abundance and is closely associated with dense mature and late successional ponderosa pine stands (structural stages 4C and 5) and white spruce forests (USDA Forest Service 2005a). Within that context, dead or decaying trees are particularly important because they provide nesting and foraging substrates. Large trees are important habitat component for brown creepers for foraging. Insect infested trees and large diameter snags provide foraging and nesting habitat (Wiggins 2005). Evidence suggests this species is area-sensitive (prefers blocks of habitat >30 acres in size), and may be susceptible to timber management and forest fragmentation (Wiggins 2005).

Forest-wide data suggests in the short-term, relative densities of the brown creeper declined in 2007 compared to previous years. Blakesly et al. (2008) projected it would take 25 years to detect a 3% annual decline for this species in pine-north, late successional and white spruce habitats, and 30 years in pine-south habitat. The Forest-wide habitat appears to be increasing based on preferred habitat (i.e., 4C, 5, & white spruce). It appears that Objective 238a is being met, although the Forest Service's ability to provide structural stage 5 and 4C with very large trees is not being met short-term. Continued effort and additional time is needed to increase the number of acres in structural stage 5 across the Forest (USDA Forest Service 2008a, 2009a).

The brown creeper is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). This species has been documented in all of the allotments except for the Porcupine Allotment. Livestock grazing per se has no affect on this species' habitat or their prey.

Golden-crowned kinglet *(Regulus satrapa)*
The Forest Service objectives that are most relevant to the golden-crowned kinglet are 211, 218, 238, and 239-LVD, which encourage maintenance of large snags and management for 20,000 acres of spruce across the Forest.

The golden-crowned kinglet is found primarily in the northern Black Hills, with more localized occurrences in the southern hills and Bearlodge Mountains. This kinglet prefers spruce communities but it may be found in lower densities in other forest types. This species forages on bark beetle larvae and may be found in heavily infested MPB areas, especially with a spruce component. It is assumed that spruce is the preferred habitat of golden-crowned kinglet on the Forest, although it is possible that this entire habitat is not occupied and that this species may be found in other areas (USDA Forest Service 2005a).

Forest-wide monitoring data suggests in the short-term, the golden-crowned kinglet relative density in 2007 was the lowest since the forest bird monitoring program began in 2001. Blakesly et al. (2008) projected it would take 20 years to detect a 3% annual decline for this species in white spruce habitat. The Forest is meeting Objective 238a based on the acres of preferred habitat. In addition, the habitat continues to increase and exceed Objective 239 (USDA Forest Service 2008a, 2009a).

The golden crowned kinglet is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). This species has been documented in all of the allotments except for the Porcupine Allotment. Grazing livestock per se does not affect the habitat of this species or its prey.

Direct and Indirect Effects on Tree Nesting MIS Species:

Alternative A - No Action
There are no direct or indirect effects expected under this alternative. Since livestock grazing has no affect on the availability of foraging and nesting habitat for these tree nesting birds, there would be no effect to this species habitat if livestock grazing was terminated. Removal of livestock grazing; however, would likely increase available watering habitat for these species by raising water tables, and increasing riparian vegetation cover and composition that would protect them from predators.

Alternative B
There are no direct effects expected to tree nesting species from the grazing of livestock per se. Potential direct effects to these species may come from possible nest disturbance and associated nesting failure (loss of eggs and hatchlings) resulting from activities related to livestock grazing, such as maintenance and reconstruction of range improvement structures (e.g. fence line clearing). Indirect effects for tree nesting species would be minimal, although livestock overuse in riparian areas may alter riparian vegetation species composition, decrease cover, and watering sources that could lead to increased potential for predation (see Riparian/Aquatic MIS Species section).

Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation more than Alternative A. In riparian areas where site specific resource problems have been identified, stream morphology and hydrology would continue to be of concern in the absence of management options to address those concerns

(e.g., additional fencing, off-site water developments). These site-specific areas of concerns would improve but at a slower rate compared to Alternative A. Prey species availability (e.g., arthropods) would not be affected by this alternative.

Reduced grazing impact in riparian areas and increased streambank stability, improvement in riparian vegetation extent and diversity, and restoration of hydrologic function would benefit tree nesting MIS species similar to Alternative C.

Alternative C

There are no direct effects expected to tree nesting species from the grazing of livestock per se. Potential direct effects to these species come from nest disturbance and possible loss of nests (eggs and hatchlings) as a result of associated activities like fence line maintenance/construction, and prescribed burning. Prescribed burning in the Porcupine Allotment could decrease black-backed woodpecker preferred habitat (recently created snags) in the Jasper Fire area but may increase nesting/foraging habitat for these bark gleaning birds by creating new snags in previously unburned areas of this allotment. Prey species availability (e.g. arthropods) would not be affected by this alternative.

As in Alternative B, adjustments in actual grazing use would occur to meet desired conditions. Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation more than Alternative A. Reduced grazing impact in riparian areas and increased streambank stability, improvement in riparian vegetation extent and diversity, and restoration of hydrologic function would benefit tree nesting MIS species similar to Alternative B.

Cumulative Effects to Tree Nesting MIS Species

The exclusion of fire has increased stand densities that limit post-fire conditions preferred by black-backed woodpeckers. However, this increase in dense stand conditions and spruce habitat has benefited the golden-crowned kinglet and brown creeper.

Past activities that affect tree nesting species' habitat include timber harvest (salvage and green) by the removal of large trees and snags that would have provided nesting habitat. Management practices, including patch-cutting, overstory removal, salvage, and shelter wood harvest of ponderosa pine have converted many stands previously dominated by open, large diameter pine to stands now characterized as young even-aged stands. Treatment in spruce stands has generally been limited, and occurred primarily to manage fuels or to enhance hardwoods. Ponderosa pine stands have also experienced reductions in snag and down wood habitat due the firewood cutting, which was allowed forest-wide until 1997. Personal use firewood collection of non-standing dead would continue to occur, along with removal of standing and downed wood in designated firewood gathering areas, which may remove nest trees and foraging substrates. High road densities in some areas provide access for firewood gatherers.

Recent wildfires, such as the Jasper Fire (Porcupine Allotment) and the Horse Creek Burn, (Bald Horse Allotment) have increased habitat short-term for the black-backed woodpecker but have reduced habitat for the brown creeper and golden-crowned kinglet. The current mountain pine beetle epidemic (USDA Forest Service 2009a) has increased nesting and foraging habitat for tree nesting species in the short-term, but would reduce nesting and foraging habitat long-term.

Future prescribed burns are expected to be beneficial for these species. However, as mountain pine beetle (MPB) tree mortality increases, there is a greater chance of large stand replacing fires such as the Jasper Fire, which would ultimately reduce habitat for these species long-term.

Changes in private land from agricultural purposes to developed communities has reduced habitat for these species. In addition, past and future fuel reduction projects including removal of standing and downed wood within 200 feet of private land, construction of fuel breaks, thinning of spruce stands adjacent to private land, and prescribed burns to protect private property from wildfire would likely reduce habitat for these species. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Conclusions for Tree Nesting MIS Species

Overall, livestock grazing would not change forest canopy, reduce large trees, reduce large snags, or affect foraging substrates for tree nesting species. The implementation of Alternatives B or C would have minimal cumulative effect on tree nesting species due to livestock grazing and associated range improvements. None of the alternatives would influence the Forest-wide population trend, Forest-wide habitat trend, or attainment of Objective 238 for the black-backed woodpecker, brown creeper, and golden-crowned kinglet, therefore these species are likely to persist.

Riparian/Aquatic MIS Species:

The beaver and song sparrow are dependent on riparian habitat/vegetation, and are analyzed together in this section.

Beaver *(Castor canadensis)*
Forest Plan objectives that most closely apply to beaver in the Mystic Range Project allotments are 103, 104, 108, 201, 213, 214, and 238. Long-term stream health and sustained water flows as they relate to the Mystic Range Project are discussed in the Hydrology Specialists Report. Objectives 201 and 213 encourage maintenance of aspen and riparian area diversity, physical structure, and size. Such habitats are used by beaver for food, dams, and shelter. Forest Plan standards and guidelines 1301, 1302, 2207, 2505c &d, 3210, and 3212 would maintain or enhance habitat for this species.

Beaver occur throughout much of North America. They are semi-aquatic, and in the Black Hills and elsewhere, are widely distributed in streams, lakes, and marshes where permanent water is present. Beaver require aspen, willow, or cottonwood as a main food source. Beaver also use these and other woody plants to construct their dams and lodges. Beavers are considered a keystone species, because of their ability to restore degraded wetlands and provide habitat for many other species. Other than overharvest for fur, the most serious threats to beaver populations are habitat destruction and degradation due to human land uses such as water manipulations, livestock grazing in riparian areas, and urban and agricultural development in riparian/wetland areas. Human population growth and increasing demands on water resources have led to water storage, diversion, and channelization projects that affect water available in rivers, lakes, and wetlands (Boyle and Owens 2007). Large herbivores, such as deer, elk, may compete with beavers for riparian vegetation. These native species may reduce beaver food supply by eating shoots of aspen and other woody species or by trampling willow stands and suppressing stand reproduction. Livestock, especially cattle grazing in riparian areas, can also degrade beaver habitat by removing woody

vegetation (Boyle and Owens 2007). Restoring beaver populations to their maximum capability on the Forest would require restoring and maintaining healthy riparian ecosystems that would increase the potential for beaver re-establishment (Boyle and Owens 2007). In South Dakota, beaver are classified as furbearers, and as such are legally harvested during a three month period.

Baseline beaver surveys conducted on the Forest during 2004 indicated 259 - 392 beaver existed in nearly 80 known colonies. The long-term beaver population trend has increased in the Black Hills since heavy trapping was moderated by hunting regulations but it is less than its potential. The long-term habitat trend suggests decline, as evidenced by the decreasing quality of riparian habitats since European settlement, and a decrease in the amount of aspen over the past 30 years. In 2007, beaver abundance and distribution was monitored. Surveys were performed via helicopter to locate beaver food caches. Preliminary data resulted in a food cache density of approximately one cache for every 24 miles of perennial stream. Overall, 20 of the 52 sixth level watersheds (38%) surveyed had beaver food caches present (USDA Forest Service 2008a). Additional time is needed to determine the trend in beaver abundance and distribution based on the food cache protocol (USDA Forest Service 2008a). Beaver have been documented in all allotments except for the Porcupine Allotment.

Song sparrow *(Melospiza melodia)*

Forest Plan objectives that most closely apply to the song sparrow are 103, 104 and 213, 214, and 238 which encourages management that promotes long-term stream health and riparian area diversity, physical structure, and size. Forest Plan riparian area objectives (i.e., 213 and 214) that promote restoration of riparian habitats may be accomplished long-term through management of livestock. Forest Plan standards and guidelines 1301, 1302, 2505c and d, 3210, and 3212, would maintain or enhance habitat for this species.

This species is a summer resident of many Black Hills riparian areas, but it is most common in the northern hills. It occurs mainly in streamside thickets, especially willows, and is dependent upon these habitats throughout the breeding season. This sparrow has also been found in spruce areas adjacent to streams. The song sparrow forages on the ground in dense underbrush for invertebrates, seeds, and fruits. Nests are low to the ground in shrubs and understory vegetation (Arcese et al. 2002, USDA Forest Service 2005a). Greatest threats to this species are loss of deciduous riparian habitat to human development, conversion to agricultural land and livestock grazing (Tewksbury et al. 2002). Human population growth and increasing demands on water resources have led to water storage, diversion, and channelization projects that affect water available in rivers, lakes, and wetlands. Livestock grazing in riparian areas can degrade song sparrow habitat by removing woody vegetation, destroying nests, and increase parasitism and predation rates (Tewksbury et al. 2002).

Forest-wide monitoring data suggests in the short-term, the relative density of song sparrows in 2008 had slightly declined since the forest bird monitoring program began in 2001. Blakesly et al. (2008) projected it would take 20 years to detect a 3% annual decline for this species in the three riparian habitat types monitored (Rocky Mountain Bird Observatory 2001-2009). Riparian habitats have decreased in quantity and quality since the pre-European settlement era, indicating a long-term declining habitat trend (Parrish et al. 1996). Implementation of Forest Plan standards and guidelines, regional watershed conservation practices and best management practices maintain riparian habitat, but at less than its full potential. Small riparian protection projects that have

improved riparian conditions in some areas contribute to habitat enhancement and achievement of Objective 238a. The song sparrow is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). This species has been documented in all of the allotments.

Direct and Indirect Effects on Riparian/Aquatic MIS Species:

Alternative A- No Action

There are no direct effects expected under this alternative to either of the riparian/aquatic MIS species. The possibility of song sparrow egg or nestling mortality due to livestock trampling would be eliminated. Indirect effects from a lack of grazing include increased herbaceous vegetation (e.g., willow, aspen) used for nesting and concealment cover, elevated water tables, improved water quantity and quality, lower water temperatures, and increasing the size and width of riparian/stream habitat. Since over-utilization of riparian habitat affects food resources for beaver, the lack of grazing could potentially increase populations of beaver in these allotments. Song sparrows have been found to increase significantly in areas where livestock grazing was discontinued (Krueper 1992). The overall available habitat for these species would improve in these allotments. Riparian recovery would occur but the rate of recovery would be slower in more degraded riparian habitat. In some cases where non-native plant communities have become established or hydrologic function has been severely altered, restoration to historic conditions may not be achievable. In general, Alternative A would improve habitat for riparian dependent species at a greater rate compared to Alternatives B and C.

Alternative B

Direct effects to beaver are not anticipated. Direct effects to song sparrows may include potential mortality from crushing song sparrow eggs or chicks, knocking eggs or chicks out of nests, or covering nests with manure.

Livestock grazing may indirectly affect riparian species that utilize understory and mid-story vegetation for cover, feeding, building nests, or creating dams. Livestock grazing would trample stream banks, removing overhanging vegetation, widen channels, aggrading channels, increasing water temperatures, and lowering the water table; all of which lead to reduced riparian shrub habitat (Boyle and Owens 2007, Jellison et al. 2007, Belsky et al. 1999, Finch et al. 1997, Kauffman et al 1983, Kauffman and Krueger 1984, Belica and Nibbelink 2006). Livestock grazing has the potential to accelerate the breakdown of beaver ponds, degrade springs/seeps, and to over-utilize riparian vegetation (i.e., willows, aspen, and other hardwood components), therefore reducing habitat suitability for beaver (NatureServe 2009). For ground nesting birds, such as the song sparrow, removal of vegetation adjacent to a nest can increase the risk of predation on eggs or chicks (Ammon and Stacey 1997). Tewksbury et al. (2002) found that song sparrows responded negatively to livestock grazing.

Under current management, residual levels of key riparian plant species have not been established, which has resulted in grazing levels higher than desired. In general, utilization of willows in riparian areas by livestock and/or big game is currently exceeding Forest Plan levels in some areas. Designated Monitoring Area (DMA) data suggest stream banks in seven of the eight allotments are stable (Bald Horse, Palmer Gulch, Rimmer, Redfern, Slate Prairie, and Tigerville); the remaining area indicate declining streambank stability (Deerfield). The extent and diversity of riparian vegetation varies between allotments. While none of the allotments currently meet desired

conditions for hydric plant species, two of the eight allotments (Palmer Gulch and Redfern) are closer to desired conditions than the remaining allotments.

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. Design criteria include a Drought Management approach that would allow for temporary adjustment of the annual livestock numbers and season of use during periods of drought. Current utilization patterns would continue or be adjusted based on annual monitoring results, and other factors (e.g., drought, fire) on a pasture by pasture basis. Some improvement in upland and riparian conditions and trends would occur with adjustments in the Annual Operating Instructions (AOI) and those management options (e.g., herding, mineral placement) available under this alternative that would improve livestock distribution away from riparian areas. In allotments where the capability assessments indicate over-stock conditions; there is a greater probability that AUMs would be reduced to meet Desired Conditions long term. For allotments where the capability assessments indicate under-stocked conditions, there is less potential that AUMs would be reduced long-term. However, to meet desired conditions, a reduction in actual use could occur in some allotments.

Livestock are expected to be moved to the next pasture before thresholds for upland (50% utilization) or riparian (four inch stubble heights) are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian threshold would likely cause livestock to move to another pasture regardless of use in the uplands. By implementing riparian stubble height requirements, there is a greater potential livestock would leave the allotment earlier (removal) in the grazing season short term (3-5 years). This would depend on the permittees' commitment to managing distribution of livestock, especially way from riparian areas. Reduced grazing that result in increased streambank stability, improvement in riparian vegetation, extent, and diversity, and restoration of hydrologic function would benefit riparian dependent species. Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation more than Alternative A. A lag time between actual livestock use, implementation of various management options to improve livestock distribution, and effectiveness monitoring may lengthen the period before changes in riparian condition could be noted.

In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). Riparian areas with resource concerns include Slate Creek in both the Redfern and Slate Prairie Allotments, Crooked Creek in the Rimmer Allotment, Victoria Creek in the Bald Horse Allotment, and Spruce Gulch in the Redfern Allotment (See Range and Hydrology Specialist Reports). In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C.

Since livestock prefer cooler mesic areas during hot dry periods (Parsons et al. 2003, McInnis and McIver 2009), permittees commitment to moving livestock out of the riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. If livestock distribution out of

riparian areas does not occur, riparian thresholds would cause livestock to be moved earlier than planned in each pasture, potentially resulting in livestock removal from the allotment prior to late summer and fall (late August through October). Results from early removal would be beneficial to riparian/aquatic species in several ways. Livestock prefer to browse shrub species later in the season due to browse increased protein content and palatability compared with the declining quality of herbaceous components available (Parsons et al. 2003, Ehrhart and Hanson 1997, Gillen et al. 1985). Early removal would reduce browsing impacts to riparian shrub species. In addition, early removal may improve riparian areas by reducing stream bank instability and alteration caused by trampling, allow time for subsequent re-growth of plant species (e.g., carbohydrate storage, seed production) and lengthen the non-grazed recovery period before high flows the following year (McInnis and McIver 2009, Ehrhart and Hansen 1997, Boyd and Svejcar 2004). Potentially, movement toward desired conditions could take a shorter period of time compared to Alternative C, if livestock continue to be moved from the pastures prior to planned dates long term (>5 years). However, there is a potential that actual use on some allotments, especially those under-stocked, would remain the same if permittees actively improve livestock distribution away from riparian areas. If distribution away from riparian areas allows for a longer season of use, Alternative B and C would be similar in effects in both long-term.

Alternative C

Direct and indirect effects to beaver and song sparrows and their habitats are similar to the effects discussed under Alternative B.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. Off-site water developments and relocation of watering structures appear to be an important tool to encourage livestock to move away from riparian areas (Ehrhart and Hansen 1997). Where riparian exclosures are created, these non-grazed areas would likely improve riparian conditions similar to Alternative A. In general, these additional management options should improve riparian vegetation composition, increase streambank stability, and restore hydrologic function in riparian areas more so than Alternative B.

As with Alternative B, livestock are expected to be moved to the next pasture before thresholds for upland and riparian stubble heights are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian utilization levels would cause livestock to move to another pasture regardless of use in the uplands. By implementing riparian stubble height requirements, there is a greater potential livestock would leave the Forest earlier in the grazing season short term (3-5 years), similar to Alternative B. This would depend on the permittees' commitment to implementation of structural improvements and managing distribution of livestock, especially away from riparian areas. As in Alternative B, adjustments in actual grazing use would occur to meet desired conditions. Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation more than Alternative A. Reduced grazing impact in riparian areas and increased streambank stability, improvement in riparian vegetation extent and diversity,

and restoration of hydrologic function would benefit riparian dependent species similar to Alternative B. A lag time between actual livestock use, implementation of structural improvements (funding and construction), and effectiveness monitoring may lengthen the period before changes in riparian condition would be noted.

It is anticipated that structural improvements, when implemented, would improve livestock distribution. This could likely increase the duration that livestock spend in a pasture before riparian thresholds are exceeded. Therefore, in the long term (>5 years), there is less potential for early removal of livestock before their forage preferences change to browse species. Late season use may be detrimental to the health of riparian areas when browsing of willows is more likely to occur, re-growth period is shortened, streambank instability due to trampling increases and non-grazed recovery period is reduced. Such impacts to shrub species and reduced vegetation productivity would reduce habitat for riparian/aquatic species. Potentially, movement toward desired conditions could take a longer period of time as compared to Alternative B due an extended grazing season. Therefore, there is slightly greater potential to increase the effects to riparian communities and the species that use them compared to Alternative B. However, as in Alternative B, the permittees' commitment to moving livestock out of riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. With setting riparian stubble height requirements, Alternative B and C would be similar in effects in the short term.

Prescribed burning in the Porcupine Allotment would not affect these species, due to the lack of riparian habitats and stream courses.

Cumulative Effects on Riparian/Aquatic MIS Species:

Historic livestock overgrazing, the reduction of beaver, road construction, timber harvest activities, recreation use, mining activities, land development and the resulting degradation of the majority of stream channels, and lowering of water tables in the allotments have affected the function and potential for many riparian areas to support riparian shrub and hardwood component. The resultant decline in hydrologic function has reduced riparian species such as green ash, cottonwood, aspen, birch, and willow to isolated, fragmented patches. Drought conditions over the past decade exacerbated the poor condition of most riparian areas. Ungulate browse and conifer encroachment has also led to the suppression of hardwood regeneration and development.

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Higher conifer densities have resulted in decreased water to riparian habitat and thus negatively affected riparian areas. Fire suppression has eliminated a primary disturbance agent for regeneration of aspen. Conversely, beneficial effects to riparian habitats have resulted from past and current removal of pine trees, prescribed burns, and wildfires. Riparian hardwood and grassland habitats have been enhanced by removing encroaching conifers. Future removal of pine through vegetative treatments is expected. Effects would be similar to those previously described.

Stand replacing wildfires have increased grassland and hardwood communities but have negatively affected riparian areas in those burns. Sediment, changes in stream morphology, and hydrologic function has affected water temperatures, pH, and water quality needed for aquatic invertebrates. These changes may influence distribution of riparian dependent species. Future prescribed burns are not expected to have the adverse effects associated with high intensity, high severity wildfires.

Road/trail location and recreation use (motorized vehicles) has negatively affected some aquatic habitat through trampling of vegetation, increased sediment, destabilizing banks, and the spread of noxious weeds. High road densities increase the chances of beaver being trapped out of drainages, which reduces the effectiveness of beaver complexes to improve water tables and increase willows. In addition, due to the close proximity of streams to roads and residents, beaver are commonly removed to prevent flooding and damage to structures. However, the Black Hills National Forest is in the process of determining a forest-wide travel management plan, which would eliminate motorize travel off-road and limit motorized use to specific areas/roads and limit use periods, reducing the impacts to these species.

Private land uses increase the potential for loss of hydrologic function in many of the allotment riparian areas. Road construction, water impoundments, wells, draining of wetlands, clearing and development would likely impact available water and would reduce habitat for riparian dependent species. Overgrazing on private land would have a negative effect on these riparian dependent species as well as their habitat.

Livestock grazing and grazing by wild ungulates would continue in riparian areas. For riparian/aquatic MIS species, loss of hardwood and shrub habitat, trampling of beaver dams, reduced nesting success, and hydrologic problems are likely to continue, to varying degrees. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Conclusions for Riparian/Aquatic MIS Species

Assuming Forest Plan utilization standards are met in the future, Forest-wide song sparrow, and beaver populations would likely remain stable, and allow for the attainment of Forest Plan Objective 238. Riparian dependent species would benefit most from Alternative A. The Phase II Amendment FEIS determined that there would be adequate habitat for maintaining riparian/aquatic species if standards and guidelines are followed, and if conditions move towards riparian restoration objectives. Implementation of Alternatives B and C would follow Forest Plan standards and guidelines and contribute to riparian stability or improvement, therefore these species are likely to persist.

Grasshopper Sparrow *(Ammodramus savannarum)*

The grasshopper sparrow has dual management status; it is both an MIS and a R2 sensitive species. To reduce redundancy, most life history, current condition, and predicted effects information are provided in the Mystic Range Project Wildlife BA/BE. Only MIS-specific documentation requirements are provided here (e.g., trend information, analysis of Objective 238). Forest Plan objectives that most closely apply to the grasshopper sparrow are 205, 218, 221, and 238. Objective 205 provides direction to manage for 122,000 acres of prairie grassland and 3,600 acres of meadow. Forest Plan standards 2107, 2505, and 3125 would be applicable to this species.

In the Black Hills, this species is found mostly in native mixed-grass prairies, but is documented in other types of grasslands (RMBO 2001-2009, Vickery 1996). This species appears to be “area sensitive” (>30 ha), with a close association with grasslands of intermediate height. Over-grazing in mixed- and short grass prairies is a serious threat to grasshopper sparrow habitats. Livestock grazing has replaced the native grazers (bison, pronghorn, and prairie dogs) that do not mimic the historical grazing patters of these native herbivores. These native ungulates movements provided a

variety of successional stages and conditions. Current livestock practices cause the vegetation to become too short, too open, and uniform heights for grasshopper sparrow use. However, when grazing was restricted to light to moderate levels, there was little effect to grasshopper sparrow densities (Slater 2004). Threats to this species are habitat loss due to conifer encroachment, habitat fragmentation, and habitat degradation from grazing and fire regimes that often fail to replicate the natural dynamics under which these species and their habitat evolved (Slater 2004, USDA Forest Service 2005a).

According to the FPMER, density estimates for the grasshopper sparrow have continued to increase since 2002. Grassland cover types are currently below management objectives. The general perception is that grassland habitats have been declining due to pine encroachment. However, the forest is maintaining existing grassland habitat consistent with Objective 238a and additional time and effort is needed to achieve the grassland acreage identified in Objective 205 (USDA Forest Service 2008a, 2009a).

In the Mystic Range Project area, there are approximately 6,185 acres of grassland communities. Additional acres of grassland probably exist, especially on soils that have formed under grass. This species has been documented in the Jasper Fire area, Reynolds and Slate Prairies, and the Bald Hills.

Direct and Indirect Effects to Grasshopper Sparrow:

Alternative A - No Action
There are no direct effects expected under this alternative. Indirect effects include increasing the amount of nesting habitat, foraging habitat and prey abundance. However, this species evolved with sporadic grazing by ungulates (e.g., bison, deer, and elk) which created a patchy mosaic of short and tall grass. Light to moderate grazing has had a beneficial effect on nesting and forage quality for this species. Therefore, the potential exists that with no livestock grazing, nesting and forage quality along with grasshopper sparrow abundance could decline. Studies have shown that grasshopper sparrows avoid tall dense grassland areas (Slater 2004). In the absence of grazing, pine encroachment into native grasslands may increase, negatively affecting this species by increasing predation rates due to cover, providing raptor perches along with a reduction of grassland patch size. This alternative would provide habitat for this grassland species to a lesser degree compared to the action alternatives.

Alternative B
Direct effects from livestock grazing include potential mortality of eggs and nestlings due to trampling nests, crushing eggs or chicks, knocking eggs or young out of nests or beds, or covering eggs, chicks or young with manure piles. Light to moderate grazing has had beneficial effect on nesting and forage quality for this species. However, livestock grazing may indirectly affect the grasshopper sparrow by reducing its ability to avoid predators by removing required cover, increasing parasitism, changing grassland species composition, and reducing prey abundance, especially if grazing practices favor uniformly grazed areas (Finch et al. 1997). Under current management, some areas are currently over-stocked or livestock are poorly distributed in allotments, which results in grazing levels higher than desired. This results in low graminoid stubble height, thus eliminating important hiding cover that may increase predation. Under this alternative, grazing would continue but livestock are expected to be moved to the next pasture before thresholds for upland (50%

utilization) or riparian (four inch stubble heights) are reached. This would be based on annual variations in weather (e.g., drought) and range readiness, and the rate at which utilization or thresholds are met. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian utilization levels would cause livestock to move to another pasture regardless of use in the uplands. However, grazing large grasslands during the nesting season would have more effect on grasshopper sparrows than grazing them in the dryer/hotter season by increasing nest disturbance, loss of nesting cover and increasing predation rates (DelCurto et al. 2005). Early season grazing could negatively affecting reproduction rates for these sparrows at a greater rate compared to Alternative A. The Porcupine Allotment is managed under HRM system which may result in reduced stubble height and increased forage utilization to more than 50%. These stubble heights may have a negative short-term effect on grasshopper sparrow habitat by reducing stubble heights below three inches, but would have a positive long-term effect on this species by maintaining native grasses and increasing plant species diversity. Adherence to Forest Plan standards, guidelines, and utilization standards should provide adequate habitat for these species but to a lesser degree than Alternative A. Effects would be similar to Alternative C.

Alternative C

Direct effects from livestock grazing include potential mortality of eggs and nestlings due to trampling nests crushing eggs or chicks, knocking eggs or young out of nests or beds, or covering eggs, chicks or young with manure. Indirect effects are similar to Alternative B.

Under this alternative, management options that allow new structures would help achieve better distribution of livestock across the allotment pastures and protect some riparian/stream areas from livestock damage (See riparian/aquatic MIS section). Construction of new structures would change distribution and use in areas currently under-utilized, especially where additional water sources are made available. This could increase the effects to the grasshopper sparrow, if light grazing changes to moderate grazing intensity. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate habitat for these species.

Prescribed burning in the Porcupine Allotment could affect grasshopper sparrow nesting and foraging habitat depending on timing, intensity, and severity. Prescribed burning could benefit this species by maintaining and/or increasing patch size of grasslands. However, frequent disturbances negatively affect sparrow habitat on short-grass and mixed grass prairies. Light to moderate grazing during the spring and the fall, along with well-timed prescribed fire that mimics the natural dynamics of grasslands, has been shown to enhance grasshopper sparrow habitat, thus increasing abundance (Bock et al. 1992, Dechant et al. 1998). Alternative C would improve nesting and foraging habitat for this sparrow species similar to Alternative B, but to a lesser degree than Alternative A.

Cumulative Effects to Grasshopper Sparrow

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Fire suppression has eliminated a primary disturbance agent needed to maintain large expanses of grassland needed by this species. The lack of fire has allowed pine to encroach into former grasslands, thus reducing habitat for this species over time. Past harvest activities that cause soil disturbance, usually results in pine regeneration. Vegetative treatments that cause ground disturbance in native grassland areas likely have increased the

potential for invading pine in these plant communities. Conversely, beneficial effects to upland grasslands have resulted from past and current removal of encroaching pine trees, grassland restoration projects, prescribed burns, and wildfires. Future removal of pine through vegetative treatments is expected. However, forest succession and fire suppression would likely continue.

Development of private land, construction of roads, conversion of native grasslands through agricultural practices, and introduction of non-native species to native prairies have fragmented habitats, reduced grasshopper sparrow nesting habitat, increased predation and reduced traditional prey species habitat for this species in the allotments.

Removal of vegetation through mowing, wildfire, and prescribed burning during the critical nesting/brooding period have likely reduced suitable habitat for nesting, caused mortality, and reduced reproductive success, especially if these activities did not provide a mosaic of various grass successional stages that provide refuge for chicks and provide habitat for re-nesting.

Use of herbicides on both private and forest have decreased vegetation species diversity in native, forb- rich grasslands (e.g., montane grasslands). This likely affected the abundance of prey host/nectar plants. Pesticide use on private could reduce prey abundance that would affect grasshopper sparrow distribution.

Livestock grazing and grazing by wild ungulates would continue in grassland areas, to varying degrees. For the grasshopper sparrow, loss of cover nesting habitat, along with the potential for destruction of nests and eggs through trampling, and increased predation would likely continue on both private and forest land. Although this species evolved with ungulate grazing, overgrazing on both forest and private land would have a negative effect on this grassland dependent species as well as their habitat. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Conclusion for Grasshopper Sparrow

Assuming Forest Plan utilization standards are met in the future; Forest-wide grasshopper sparrow populations would likely remain stable, and allow for the attainment of Forest Plan Objective 238. The Phase II Amendment FEIS determined that there would be adequate habitat for maintaining this species, if standards and guidelines are followed, and if conditions move towards grassland restoration objectives. Implementation of Alternatives B and C would follow Forest Plan standards and guidelines, and contribute to maintaining this species' habitat, therefore these species are likely to persist.

Ruffed Grouse *(Bonasa umbellus)*

The Forest Plan objectives that most closely apply to ruffed grouse are 201, 213, 217, and 238. Objective 201 encourages the Forest to provide at least 92,000 acres of aspen and 16,000 acres of bur oak. Forest Plan Standards and Guidelines 2107, 2202 and 2207, 2505c, and 2505d would be applicable to maintaining habitat for this species.

Ruffed grouse are widespread throughout the Black Hills, but occur in low abundance. This species is associated with hardwoods in a variety of age classes, including mature aspen stands used for drumming. Although found in conifers and hardwoods, this species is closely tied to aspen communities, relying on aspen buds and catkins in winter and spring, respectively. They typically

nest at the base of a tree, bush, or stump. During the breeding season, drumming areas and broods are found in forests with a tall, dense understory of shrubs and abundant ground cover (Wiggins 2006, NatureServe 2009). Undisturbed riparian areas are highly valuable ruffed grouse habitat. Livestock grazing and consequent understory trampling reduce the dense understory, making it easier for nest abandonment and predation. Browsing by livestock may impede regeneration of aspen, especially where elk and deer are common, and when livestock grazing was not carefully controlled (Wiggins 2006, Jones et al. 2009). Threats are identified that likely affect grouse populations; lack of mixed-seral stage forest habitat, degradation of existing habitat due to fire suppression, and overgrazing by livestock and wild ungulates, and perturbations to local hydrology (Wiggins 2006). The ruffed grouse is classified by SDGFP as an upland game bird with an annual hunting season in the fall (Wiggins 2006, USDA Forest Service 2005a).

According to FPMER, the long-term habitat trend for ruffed grouse is one of decline given the reduction of aspen acreage compared to historic conditions. This has likely resulted in an associated population decline for ruffed grouse. Loss of aspen habitat is attributed to conifer encroachment and lack of periodic natural fire. There has been a slight decline in aspen acres over the ten-year period and additional time and effort would be needed to meet Objective 238a. Development and implementation of a ruffed grouse monitoring protocol should allow for the detection of long-term population trend (USDA Forest Service 2008a, 2009a).

The ruffed grouse is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). Currently, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These treatments are to enhance species diversity and improve habitat for selected focus species. In the Mystic Range Project, there are approximately 3,118 acres dominated by aspen. Ruffed grouse has been documented in the all of the allotments except the Bald Horse Allotment.

Direct and Indirect Effects to Ruffed Grouse:

Alternative A - No Action
There are no direct effects expected under this alternative. The possibility of loss of nests, eggs, and chicks due to livestock trampling is eliminated. Indirect effects include increasing aspen/birch regeneration by reducing browsing, raising water tables, increased water quality, and increases in riparian composition and structure. Kilpatrick (2001) found that restricting cattle grazing led to improved aspen regeneration. However, browsing of young aspen by wild ungulates would continue. The overall available habitat for ruffed grouse would improve if livestock grazing is no longer allowed on these allotments.

Alternative B
Direct effects may include potential mortality from crushing grouse eggs or chicks, knocking eggs or chicks out of nests, or covering nests with manure. Indirect effects include the potential for livestock grazing to impede succession of aspen stands by browsing aspen leaders (Jones et al. 2009, Ehrhart and Hanson 1997), soil compaction due to trampling that would reduce suckering, and creating trails for predators. Loss of vegetation adjacent to a nest can increase the risk of predation on nests by predators (Ammon and Stacey 1997). Livestock grazing has the potential to accelerate the breakdown of beaver ponds, degrade springs/seeps, and to over-utilize

riparian vegetation (i.e., willows, aspen, and other hardwood components) which reduces brood habitat for grouse. Insect prey availability for broods may decrease in hardwood and riparian habitats. Thus, livestock grazing can influence this species by changing vegetation structure and food supplies (See riparian/aquatic MIS discussion- Alternative B).

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. Design criteria include a Drought Management approach that would allow for temporary adjustment of the annual livestock numbers and season of use during periods of drought. Current utilization patterns would continue or be adjusted based on annual monitoring results, and other factors (e.g., drought, fire) on a pasture by pasture basis. Some improvement in upland and riparian conditions and trends would occur with adjustments in the Annual Operating Instructions (AOI) and those management options (e.g., herding, mineral placement) available under this alternative that would improve livestock distribution away from riparian areas. In allotments where the capability assessments indicate over-stock conditions; there is a greater probability that AUMs would be reduced to meet desired conditions long term. For allotments where the capability assessments indicate under-stocked conditions, there is less potential that AUMs would be reduced long-term. However, to meet desired conditions, a reduction in actual use could occur in some allotments.

Livestock are expected to be moved to the next pasture before thresholds for upland (50% utilization) or riparian (four inch stubble heights) are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian threshold would likely cause livestock to move to another pasture regardless of use in the uplands.

Since livestock prefer cooler mesic areas during hot dry periods (Parsons et al. 2003, McInnis and McIver 2009), permittees commitment to moving livestock out of the riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. If livestock distribution out of riparian areas does not occur, riparian thresholds would cause livestock to be moved earlier than planned in each pasture, potentially resulting in livestock removal from the allotment prior to late summer and fall (late August through October). Livestock prefer to browse shrub species later in the season due to browse increased protein content and palatability compared with the declining quality of herbaceous components available (Parsons et al. 2003, Ehrhart and Hanson 1997, Gillen et al. 1985). Early removal would reduce browsing impacts to hardwood species. Less browsing on aspen terminal leaders would improve growth, increasing the amount of aspen in the MRPA (Jones et al. 2009). Jones et al. (2009) suggests that both livestock grazing intensity and season of browse affects aspen regeneration, especially when terminal leaders are browsed greater than 20% and grazing occurred after July. In addition, early removal may improve riparian areas by reducing stream bank instability and alteration caused by trampling, allow time for subsequent re-growth of plant species (e.g., carbohydrate storage, seed production), and lengthen the non-grazed recovery period before high flows the following year (McInnis and McIver 2009, Ehrhart and Hansen 1997, Boyd and Svejcar 2004). Potentially, movement toward desired conditions could take a shorter period of time compared to Alternative C if livestock continue to be moved from the pastures prior to planned dates long term (>5 years). However, there is a potential that actual use on some allotments, especially those under-stocked, would remain the same if permittees actively improve

livestock distribution away from riparian areas. If distribution away from riparian areas allows for a longer season of use, Alternative B and C would be similar in effects long-term.

Alternative C

Direct effects and indirect effects to ruffed grouse are similar to the effects discussed under Alternative B. Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. Off-site water developments and relocation of watering structures appear to be an important tool to encourage livestock to move away from riparian areas (Ehrhart and Hansen 1997). Where riparian exclosures are created, these non-grazed areas would likely improve riparian conditions similar to Alternative A. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B.

As with Alternative B, livestock are expected to be moved to the next pasture before thresholds for upland and riparian stubble heights are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian utilization levels would cause livestock to move to another pasture regardless of use in the uplands. By implementing riparian stubble height requirements, there is a greater potential livestock would leave the Forest earlier in the grazing season short term (3-5 years), similar to Alternative B. This would depend on the permittees' commitment to implementation of structural improvements and managing distribution of livestock, especially away from riparian areas. As in Alternative B, adjustments in actual grazing use would occur to meet desired conditions. Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation more than Alternative A. Reduced grazing impact in riparian areas and increased streambank stability, improvement in riparian vegetation extent and diversity, and restoration of hydrologic function would benefit riparian dependent species similar to Alternative B. A lag time between actual livestock use, implementation of structural improvements (funding and construction), and effectiveness monitoring may lengthen the period before changes in riparian condition would be noted.

It is anticipated that structural improvements, when implemented, would improve livestock distribution. This could likely increase the duration that livestock spend in a pasture before riparian thresholds are exceeded. Therefore, in the long term (>5 years), there is less potential for early removal of livestock before their forage preferences change to browse species. Due to changes in livestock distribution, upland utilization is expected to increase in areas where currently there is little or no use occurring, which could affect ruffed grouse forage and cover habitat. Livestock browsing from August through the rest of the season would likely reduce aspen regeneration potential, especially when terminal leaders are browsed more than 50%. In addition, late season use may be detrimental to the health of riparian areas when; browsing of willows is more likely to occur, re-growth period is shortened, streambank instability due to trampling increases and non-grazed recovery period is reduced. Potentially, movement toward desired conditions could take a longer period of time as compared to Alternative B due to an extended

grazing season. Therefore, there is slightly greater potential to increase the effects to ruffed grouse habitat compared to Alternative B. However, as in Alternative B, the permittees' commitment to moving livestock, especially out of riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. With implementation of riparian stubble height requirements, Alternative B and C would be similar in effects in the short term.

Prescribed burning in the Porcupine Allotment would likely increase habitat, if burn intensity and duration is conducive to regenerating aspen. Direct and indirect effects from prescribed burning should have a minimal effect short-term but would likely increase hardwood habitat long-term. However, grazing management under the Holistic method may negatively affect aspen stands if grazing intensity is high and occurs after July. Adherence to Forest Plan standards, guidelines and utilization standards should maintain suitable habitat for the ruffed grouse similar to Alternative B.

Cumulative Effects to Ruffed Grouse

The greatest effect to ruffed grouse has been the loss of healthy aspen stands due to fire suppression and forest succession. Past harvest activities, forest succession, and fire suppression activities have resulted in a much denser, later seral forest condition. Fire suppression has eliminated a primary disturbance agent for aspen regeneration. Early successional species, such as aspen, are slowly declining, negatively affecting grouse habitat. In addition, higher conifer densities have resulted in decreased water to riparian areas and thus negatively affected riparian habitats. Loss of early seral stage aspen, due to forest succession, contributes cumulatively with loss of aspen in riparian areas from past over-utilization by livestock. Wildlife preference for aspen as an important browse species has likely impacted aspen regeneration, especially in the winter when forage is scarce. Conversely, beneficial effects to grouse habitat occur from past and future vegetative treatments, since open canopies stimulate hardwood regeneration and growth. Removal of pine in hardwood stands and riparian areas, prescribed burns, and hardwood regeneration improves habitat for this species. Forest plan goals to increase the number of acres of aspen/birch/oak would improve conditions for this species. Future removal of pine and hardwood restoration through vegetative treatments is expected. Effects would be similar to those previously described.

Recent stand replacing wildfires have increased aspen communities but have negatively affected riparian areas in those burns. Sediment, and changes in stream morphology and hydrology has affected water temperatures, pH, and water quality needed for most species. However, the increase in early seral aspen would benefit the ruffed grouse long-term. Future prescribed burns are expected to provide benefits to this species.

Road/trail location and recreation use (motorized vehicles) has negatively affected some aquatic habitat through trampling of vegetation, increased sedimentation, destabilized banks, and the spread of noxious weeds. A common forest practice to regenerate aspen is to cut mature stems and leave slash at a sufficient height and density to deter ungulate browsing. High road densities increase the potential for downed aspen in these areas to be removed for fuel wood, thus removing barriers to ungulates. In addition, open road densities increase the potential for beaver trapping, grouse hunting, and road kill. Beaver being trapped reduces the effectiveness of beaver complexes to improve water tables and increase aspen and willows.

Land uses on private land increases the potential for loss of hydrologic function in many of the allotment riparian areas. Road construction, water impoundments, wells, draining of wetlands, clearing, and development would likely impact available water, and affect downstream habitat.

Livestock grazing and grazing by wild ungulates would continue on both forest and private land in hardwoods and riparian areas. For ruffed grouse, loss of hardwoods, understory shrub habitat, trampling of beaver dams, reduced nesting success, and hydrologic problems are likely to continue. Overgrazing on both forest and private land would have a negative effect on this species, as well as their habitat. Alternatives B and C are expected to contribute to cumulative effects, but not to a greater degree than currently exists.

Conclusion for Ruffed Grouse

Assuming Forest Plan standards are met in the future, all alternatives would allow the Forest-wide ruffed grouse population to remain stable, and would allow for the attainment of Forest plan Objectives 217 and 238. Aspen and other hardwood habitat is expected to be maintained because of Forest-wide standards and guidelines mentioned above.

Ruffed grouse species would benefit most from Alternative A. However, the Phase II Amendment FEIS determined that there would be adequate habitat to maintain a viable population of ruffed grouse if standards and guidelines are followed, and if conditions move towards hardwood restoration objectives. Alternatives B and C comply with Forest Plan standards and guidelines, therefore these species are likely to persist. This project is not expected to limit hardwood restoration (Objective 201). Under all alternatives, there would be adequate habitat for maintaining viable populations of ruffed grouse on the Forest.

White-tailed Deer *(Odocoileus virginianus)*

The Forest Plan objectives that most closely apply to white-tailed deer are 201, 203, 205, 213, 217, 238, and 301, 4.1-203, 4.2B-201-203, 5.1-203-204, 5.4-206, 5.4A-203-206. 5.4A-209. Objective 301 allocates 127 million pounds of forage annually (128,000 AUMs) to livestock use and 106 million pounds of forage to wildlife (70,000 deer and 4,500 elk). Hardwood forests, meadows, and riparian areas are particularly important because these are the sites that produce the most forage (e.g., grasses, aspen, and various shrubs). Forest objectives strive to increase and maintain grassland, meadow, and hardwoods forest-wide. Certain ponderosa pine structural stages provide cover and forage for white-tailed deer and other big game. Forest Plan standards and guidelines 2107, 2207, 2505, 3202, 3210, 3212, 5.4-2501, 5.4-2502, 5.4A-2501-2503, 5.4A-2505 would maintain or enhance habitat for this species.

White-tailed deer are year-round residents in the Black Hills. They require a diversity of habitat types including conifer forests, hardwoods, meadows, and riparian areas to provide forage and cover. This species may utilize different areas during the summer and winter months, especially if snow pack prevents access to an adequate food supply (USDA Forest Service 2005a). Hardwood stands of aspen and birch are prominent features in white-tailed deer's selection of home ranges and their use of sites within these ranges (SAIC 2003, Stefanich 1995). Kennedy (1992) suggested aspen stands are highly selected during fawning. Suitable deer habitat should have quality forage (tall forbs and shrubs) in adequate quantities in close proximity to cover (protection from weather and predators) and water within home ranges. These requirements become important on winter

range and transitory range (SAIC 2003). However, there is no indication that these resources are limiting (USDA Forest Service 2005a).

This species is considered big game in South Dakota, with yearly harvest objectives set by the South Dakota Department of Game, Fish, and Parks (SDGFP 2008b). Deer migrate from the allotments onto traditional, lower elevation winter ranges which are primarily on private lands. Prudent management of domestic livestock can be a tool to maintain wildlife habitat. However, many of the same shrub and forb species that benefit deer also are palatable for livestock. In addition, livestock prefer to utilize aspen communities over pine or mixed pine stands in the Black Hills with a preference related to understory grass production. Considerable debate exists about the degree to which competition occurs for forage between deer, elk, and cattle (Findholt et al. 2004, Chaikina and Ruckstuhl 2006, SAIC 2003). The removal of forage by cattle can improve forage quality by enhancing re-growth or by changing forage quality, especially in the spring (Anderson and Scherzinger 1975). Prior livestock grazing may or may not have beneficial effects on elk nutrition. Although both cattle and elk changed their diets in response to a lack of their preferred forage from previous grazing, competition for forage resources becomes greater during the late summer (SAIC 2003). This has been attributed to poor forage quality that does not meet nutritional requirement of either wild ungulates or cattle (Findholt et al. 2004). Findholt et al. (2004) also suggest that inter- and intra-specific competition for forage may exist among all three herbivores and that the probability of increased competition would occur during years of low forage production, heavy herbivore stocking, or both. Sieg and Severson (1996) and Jenks and Leslie (2003) suggested that livestock be removed from winter ranges before they start consuming browse. Competition between deer and elk for forage is usually not an important management issue on the Forest but when competition does occur, elk would dominate (Coe et al. 2001). In general, deer tend to be more compatible with livestock use, but elk avoid livestock during the summer (Coe et al. 2001).

According to forest-wide monitoring, the most recent Black Hills South Dakota population estimate is approximately 62,000 deer (Huxoll 2008). Forest Plan Objective 217 supports habitat for management of 60,000 deer in the Black Hills, which matches state population objectives. According to the FPMER, the Black Hills deer population peaked in 2006 and showed a slight decline in 2007 (USDA Forest Service 2008a). The Forest-wide summer habitat trend showed an increase, and the winter habitat trend is stable to slightly decreasing (USDA Forest Service 2008a, 2009a).

Currently, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These treatments are to enhance species diversity and improve habitat for selected focus species. The white-tailed deer is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). All allotments in the Mystic Range Project are used year-round by white-tailed deer, although many deer migrate to traditional winter ranges in August. Management Area 5.4 is managed for winter populations of big game.

Direct and Indirect Effects to White-tailed Deer:

Alternative A - No Action
There are no direct effects to white-tailed deer expected under this alternative. However, as fences deteriorate, injury may occur. In general, there would be no displacement of deer by livestock through competition for high quality forage, especially in hardwoods and riparian areas. Indirect effects include improvement in understory composition and structure, improved aspen/birch regeneration, and increases in the amount of available forage on both summer and winter ranges. In addition, lack of grazing would likely improve vegetation composition and structure in riparian areas by raising the water table, improving water quality, and improving shrub and understory production that provide forage and cover. Light to moderate grazing can have a beneficial effect on forage quality by removing the rough or dried seed heads and stems, while leaving the more palatable leaves for deer or elk to graze later in the season (Anderson and Scherzinger 1975, Clark et al. 2000). Therefore, potential exists that with no livestock grazing, forage quality and production could decline for deer and elk. However, during periods of little or no vegetation growth such as in winter or during drought, vegetation removal by livestock can be detrimental to deer habitat quantity and quality. Competition for the same resources between elk and deer would continue. The overall available habitat for deer would improve in the absence of grazing in this alternative compared to Alternatives B or C.

Alternative B
Direct effects to white-tailed deer due to livestock grazing are not anticipated.

Under current management, residual levels of key riparian plant species have not been established, which has resulted in grazing levels higher than desired. Indirect effects include potential loss of foraging and cover habitat in uplands, riparian areas, meadows, and hardwood stands due to livestock grazing and browsing. In addition, decreased vegetation diversity in riparian habitats attributable to livestock grazing may result in increased predation on deer and sight-ability by hunters. The greatest potential for effects between deer and livestock would likely occur in hardwood stands and riparian zones. The effects are attributed to the limited amount of riparian and hardwood habitats on the Forest, the fact that these areas satisfy deer requirements for cover, food, water, and because of their extensive use during fawning periods. The possibility of competition exists between deer and livestock (SAIC 2003), especially if this competition leaves poor habitat conditions (poor quality and reduced availability of forage) on summer and winter range (See riparian/aquatic and ruffed grouse MIS discussion). Effects to winter grounds could be compounded by persistent over utilization of native plant communities altering their composition, vigor, and quality especially where browse has been replaced by invasive species.

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve upland and riparian plant communities from existing conditions. Design criteria include a Drought Management approach that would allow for temporary adjustment of the annual livestock numbers and season of use during periods of drought. Current utilization patterns would continue or be adjusted based on annual monitoring results, and other factors (e.g., drought, fire) on a pasture by pasture basis. Some improvement in upland and riparian conditions and trends would occur with adjustments in the Annual Operating Instructions (AOI) and those management options (e.g., herding, mineral placement) available under this alternative that would improve livestock

distribution away from riparian areas. In allotments where the capability assessments indicate over-stock conditions; there is a greater probability that AUMs would be reduced to meet desired conditions long term. For allotments where the capability assessments indicate under-stocked conditions, there is less potential that AUMs would be reduced long-term. However, to meet desired conditions, a reduction in actual use could occur in some allotments.

Livestock are expected to be moved to the next pasture before thresholds for upland (50% utilization) or riparian (four inch stubble heights) are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian threshold would likely cause livestock to move to another pasture regardless of use in the uplands. By implementing riparian stubble height requirements, there is a greater potential livestock would leave the allotment earlier (removal) in the grazing season short term (3-5 years). This would depend on the permittees' commitment to managing distribution of livestock, especially way from riparian areas. Effects from early turn off would be beneficial to big game, especially later in the grazing season as livestock start browsing shrub species when other herbaceous components are unavailable (Parsons et al. 2003, Gillen et al. 1985). Jones et al. (2009) suggests that both livestock grazing intensity and season of browse affects aspen regeneration, especially when terminal leaders are browsed greater than 20% and grazing occurred after July. Early removal would reduce browsing impacts to shrub species (e.g. aspen, chokecherry, willow), providing high quality browse for deer long-term. In addition, early removal may improve riparian areas by reducing stream bank instability and alteration caused by trampling, allow time for subsequent re-growth of plant species (e.g., carbohydrate storage, seed production) and lengthen the non-grazed recovery period before high flows the following year (McInnis and McIver 2009, Ehrhart and Hansen 1997, Boyd and Svejcar 2004).

Although livestock grazing would be reduced, grazing would still affect upland and riparian communities more so than Alternative A. Potentially, movement toward desired conditions could take a shorter period of time compared to Alternative C if livestock continue to be moved from the pastures prior to planned dates long term (>5 years). However, there is a potential that actual use on some allotments, especially those under-stocked, would remain the same if permittees actively improve livestock distribution away from riparian areas. If distribution away from riparian areas allows for a longer season of use, Alternative B and C would be similar in effects in both long-term. Both action alternatives should provide adequate forage, cover, and water for deer but to a lesser degree than Alternative A.

Alternative C

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures, that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. Off-site water developments and relocation of watering structures appear to be an important tool to encourage livestock to move away from riparian areas (Ehrhart and Hansen 1997). Where riparian exclosures are created, these non-grazed areas would likely improve riparian conditions similar to Alternative A. In general, these additional management options should improve riparian vegetation

composition, increase streambank stability, and restore hydrologic function in riparian areas more so than Alternative B (See riparian/aquatic MIS discussion).

As with Alternative B, livestock are expected to be moved to the next pasture before thresholds for upland and riparian stubble heights are reached. In general, upland areas would continue to receive disproportionate use when compared to riparian areas because riparian utilization levels would cause livestock to move to another pasture regardless of use in the uplands. By implementing riparian stubble height requirements, there is a greater potential livestock would leave the Forest earlier in the grazing season short term (3-5 years), similar to Alternative B. This would depend on the permittees' commitment to implementation of structural improvements and managing distribution of livestock, especially away from riparian areas. As in Alternative B, adjustments in actual grazing use would occur to meet desired conditions. Although livestock grazing would be reduced, grazing would still affect upland and riparian communities more so than Alternative A.

It is anticipated that structural improvements, when implemented, would improve livestock distribution. This could likely increase the duration that livestock spend in a pasture before riparian thresholds are exceeded. Therefore, in the long term (>5 years), there is less potential for early removal of livestock before their forage preferences change to browse species. Late season use may be detrimental to white-tailed deer where browsing of shrubs is more likely to occur, plant re-growth period is shortened, loss of riparian function and vegetation due to trampling increases and non-grazed recovery period is reduced. Livestock browsing from August through the rest of the season would likely reduce aspen regeneration potential, especially when terminal leaders are browsed more than 50% (See MIS ruffed grouse discussion for aspen). Such impacts to hardwood and shrub species' productivity may reduce habitat for deer long-term. Potentially, movement toward desired conditions could take a longer period of time as compared to Alternative B due to an extended grazing season. Therefore, there is slightly greater potential to increase the effects deer habitat (forage and cover) compared to Alternative B. However, as in Alternative B, the permittees' commitment to moving livestock out of riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. With setting riparian stubble height requirements, Alternative B and C would be similar in effects short term.

In MA 5.4 and 5.4A, opportunities to reduce the affects of livestock grazing in Norbeck and big game winter range are possible where conflicts between these ungulates are identified. Grazing would continue to affect deer winter foraging habitat (riparian areas and shrub component), more than Alternative A. Prescribed burning in the Porcupine allotment would move the area to an early seral stage community of grasses and forbs. Depending on the burn intensity and duration there could be an increase in aspen communities, providing forage and fawning cover long-term. However, shrub species and cover would be reduced in the short term (<5 years). Grazing management under the Holistic method may negatively affect aspen stands if grazing intensity is high and occurs after July. Prescribed burning in the Porcupine Allotment would not increase forage for deer and elk from existing conditions, but could improve access for ungulates by decreasing the amount of down dead in the area. Both action alternatives should provide adequate forage, cover, and water for deer, but to a lesser degree than Alternative A.

Cumulative Effects to White-tailed Deer

Several factors can affect deer populations including the harvesting of animals, climatic changes, quality of summer and winter ranges, and predation. Predators, such as mountain lions, have increased in recent years, which likely have an effect on big game populations. Legal and illegal harvesting of animals, and mortality caused by vehicles also impact deer populations.

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Fire suppression has eliminated a primary disturbance agent, thus affecting early seral communities such as grassland and aspen. Higher conifer densities have resulted in the decline of understory shrub and grass component, and influenced vegetation composition, growth and vigor (SAIC 2003). Vegetative treatments, such as timber harvest, thinning, hardwood restoration, meadow restoration, and prescribed fire, have improved forage availability for deer by reducing dense overstory conditions and maintaining grassland/meadow and hardwood communities. Additionally, beneficial effects to foraging habitats have resulted from past and current removal of pine trees, prescribed burns, and wildfires. Riparian hardwood and grassland habitats have also been enhanced by removing pine trees. Future removal of pine through timber sales is expected. Effects would be similar to those previously described.

Historic livestock overgrazing, the reduction of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development and the resulting degradation of the majority of stream channels and lowering of water tables in the allotments have affected the function and potential for many riparian areas to support riparian shrub and hardwood communities. Drought conditions over the last 10 years have exacerbated the poor condition of most riparian areas. The drought has also likely made deer more prone to disease as they have had to concentrate at limited watering areas. Deer succumbing to epizootic hemorrhagic disease were noted every year during the drought. Ungulate browse and conifer encroachment has also led to the suppression of hardwood regeneration and development.

Wildfires in the Mystic Range Project area (e.g., Jasper and Horse Creek) increased grasslands and hardwoods, and have increased diversity of plant species and available habitats. However, large fires reduce the spatial mosaic of cover and forage, making deer more susceptible to predation and hunting. Prescribed burns both past and future would reduce the negative effects of wildfires, while stimulating improved forage growth and vigor. Future prescribed burns expected to have mostly beneficial effects.

White-tailed deer are migratory and move between distinct summer and winter ranges. They are therefore affected cumulatively by activities occurring within the Mystic Range Project allotments, along their migratory routes and on lower elevation winter ranges. Deer distribution and habitat use has been affected by high road densities and associated disturbance from motorized recreation, including increased OHV use, and hunting pressure. Seasonal restrictions on open road densities in MA 5.4 help reduce the effects of human disturbance on deer during the critical winter months. The forest travel management plan was approved in 2010, and unlimited motorized use is now prohibited upon implementation. This would benefit deer by providing areas of security, especially where escape cover is limited.

Most of the meadows, grasslands, and riparian habitats are privately owned, especially in traditional winter range areas. Changes in private land from agricultural purposes to residential developments has greatly reduced habitat for deer on private land. Loss of habitat due to development, competition for forage from livestock, increased human disturbance, and the presence of dogs has altered distribution and habitat use of deer. Habitat loss or degradation adds cumulatively to other effects influencing white-tailed deer in the allotments. Loss of grazing permits on NFS lands could mean that the ranchers would go out of business and their private property converted to other uses (e.g. developed) resulting in additional loss of winter range habitat for deer on private lands.

Livestock grazing and grazing by wild ungulates would continue to remove herbaceous and shrubby vegetation on both forest and private land. Alternatives B and C are expected to contribute to cumulative effects but not more than what currently exists.

Conclusion for White-tailed Deer

Assuming Forest Plan standards are met in the future, all alternatives would allow the Forest-wide white-tailed deer population to remain stable, and would allow for the attainment of Forest plan Objectives 217 and 238. Deer habitat is expected to improve from current conditions.

The Phase II Amendment FEIS determined that there would be adequate forage allocated towards big game so that competition between livestock and wild ungulates for similar resources does not affect meeting South Dakota big game population objectives. In addition, habitat would be provided to maintain a viable population of white-tailed deer if Forest Plan standards and guidelines are followed, especially when conditions move towards riparian restoration objectives, structural stage objectives, and hardwood restoration objectives. All action alternatives in this project follow Forest Plan standards and guidelines.

Species of Local Concern

Species of Local Concern (SOLC) are defined as species that do not meet the criteria for sensitive species status but show a decline in only a portion of Region 2, or those that are important components of diversity in a local area. A list of SOLC for the Black Hills National Forest can be found in FSM 2620, Supplement r2_bh_2600-2005-1. The Phase II Amendment FEIS (USDA Forest Service 2005a; Sec 3-3.3.3 through Sec 3-3.3.5.8) provides in-depth information (i.e., range, distribution etc.) on Forest SOLC analyzed for the Mystic Range Project. The Mystic Range Project analysis for SOLC is tiered to that document, which is summarized in each species section. The most relevant Forest Plan objective for SOLC is Objective 221 which directs the BHNF to “conserve or enhance habitat” for SOLC and to maintain long-term persistence forest-wide. There are no specific standards or guidelines to further direct attainment of the objective for the SOLC group as a whole. However, species-specific guidance would be addressed as appropriate below.

Table 3-5 below lists the SOLC identified in the Black Hills National Forest Phase II Amendment (USDA Forest Service 2005a). If a species is known or suspected to occur in the project area or if suitable but unoccupied habitat is present or adjacent to the area, then the species has been evaluated with respect to effects of the proposed project activities. Table 3-5 is a summary of each species and a discussion of the effects of the proposed alternatives.

Table 3-5 Species of Local Concern of the Black Hills

Common Name (Scientific Name)	Species Present[1]	Suitable Habitat Present[2]	Habitat Requirements
Long eared Myotis *(Myotis evotis)*	Yes	Yes	Mostly coniferous montane habitats; uses large snags, caves, mines, abandoned buildings as maternity/hibernacula, also roosts in abandoned mines and buildings, rock crevices, and under bark. No known hibernacula in Black Hills (USDA Forest Service 2005a).
Long-legged Myotis *(Myotis volans)*	Yes	Yes	Primarily in montane coniferous forests; uses caves, mines, and snags as maternity/hibernacula, also roosts in abandoned buildings, rock crevices, and under bark (USDA Forest Service 2005a).
Northern Myotis *(Myotis septentrionalis)*	Yes	Yes	Dense ponderosa pine and mixed coniferous/deciduous forest. Hibernates in caves and mines. Maternity and day roosts in snags, buildings, caves and mines (USDA Forest Service 2005a).
Small Footed Myotis *(Myotis ciliolabrum)*	Yes	Yes	Variable habitats, but usually associated with rocky areas like bluffs, dissected breaks, ridges, cliffs, and major rock outcrops. Roosts include mines, caves, rock features, and under bark (USDA Forest Service 2005a).
Meadow Jumping Mouse *(Zapus hudsonicus campestris)*	Yes	Yes	Strongly associated with riparian habitats along small streams in meadows (Cryan and Ellison 2005). Found throughout the Black Hills of Wyoming and South Dakota (USDA Forest Service 2005a).
Mountain Goat *(Oreamnos americanus)*	Yes	Yes	Rugged terrain with cliffs, rock faces, ledges and talus slopes, typically in higher elevations of the BHNF. Limited primarily to Black Elk Wilderness Area and Norbeck Wildlife Preserve (USDA Forest Service 2005a).
Northern Flying Squirrel *(Glaucomys sabrinus)*	Yes	Yes	Dense ponderosa pine and mixed coniferous/deciduous forest; roosts in cavities or builds nests. Most often associated with cool moist habitat with abundant snags. Large openings may inhibit gliding (USDA Forest Service 2005a).
American Dipper *(Cinclus mexicanus)*	Yes	Yes	Clear, fast-flowing streams, feeds on aquatic insects and insect larvae. Nests adjacent to streams on rocky ledges, cliffs, and under bridges. Limited primarily to Spearfish and Rapid Creeks in the BHNF (USDA Forest Service 2005a).
Black and White Warbler *(Mniotilta varia)*	Yes	Yes	Prefers mature and second growth deciduous and mixed deciduous coniferous forest with dense understory of shrubs/trees (USDA Forest Service 2005a). Limited primarily to the foothills in the BHNF (Tallman et al. 2002).
Broad-winged Hawk *(Buteo platypterus)*	No	Yes	Found primarily in mixed ponderosa pine and deciduous habitats. Nesting in SS4B, SS4C, and SS5 (USDA Forest Service 2005a).
Cooper's Hawk *(Accipiter cooperii)*	Yes	Yes	Found in ponderosa pine, spruce, shrublands and burned areas. Nests in mature riparian, conifer, and aspen forests with moderate to high canopy closure. Associated with SS3C, SS4B, SS4C, and SS5 (USDA Forest Service 2005a).
Northern Saw-whet Owl *(Aegolius acadicus)*	Yes	Yes	Prefers dense coniferous or mixed forest for nesting habitat. Dense sapling-pole sized stands are preferred for roosting, also associated with riparian habitats (USDA Forest Service 2005a).

Common Name (Scientific Name)	Species Present[1]	Suitable Habitat Present[2]	Habitat Requirements
Pygmy Nuthatch *(Sitta pygmaea)*	Yes	Yes	Prefers relatively open canopied, very mature undisturbed ponderosa pine forests with large trees and abundant large diameter snags (USDA Forest Service 2005a). Communal winter roosts in large diameter snags (Ghalambor and Dobbs 2006).
Sharp-shinned Hawk *(Accipiter striatus)*	Yes	Yes	Forages in a variety of dense forest habitats. Nesting habitat typically restricted to dense young conifer stands such as SS3B and SS3C (USDA Forest Service 2005a).
Atlantis Fritillary *(Speyeria atlantis pahasapa)*	Yes	Yes	Riparian areas adjacent to openings and moist meadows in boreal forests in Pennington, Custer, and Lawrence Co. Larvae of this genus feed exclusively on violets (USDA Forest Service 2005a).
Tawny Crescent *(Phycoides batesii)*	Yes	Yes	Open meadows, riparian wet meadows, and woodlands that provide diverse floral nectar species such as dogbane and composite flowers. Larvae feed mostly on asters (USDA Forest Service 2005a).
Callused Vertigo *(Vertigo arthuri)*	Yes	Yes	Moist shaded coniferous habitats mixed with hardwoods, exhibiting a deep litter layer and DWM. Most sites are associated with limestone substrates, but have been found in other soil types. Forages on decayed deciduous leaves and herbaceous plants (USDA Forest Service 2005a).
Cockrell's Striate Disc *(Discus shemekii)*	Yes	Yes	Moist shaded coniferous habitats mixed with hardwoods, exhibiting a deep litter layer and DWM. Often bordering or ranging slightly into stream floodplains. Most sites are associated with limestone substrates, but have been found in other soil types. Forages on decayed deciduous leaves and herbaceous plants (USDA Forest Service 2005a).
Frigid Ambersnail *(Catinella gelida)*	Yes	Yes	Duff specialist usually associated with limestone soils. Moist to dry coniferous forest with a deep litter layer, DWM, and deciduous tree/shrub understory. (USDA Forest Service 2005a).
Mystery Vertigo *(Vertigo paradoxa)*	Yes	Yes	Moist shaded coniferous forest mixed with hardwoods, exhibiting a deep litter layer and DWM. Most sites are associated with limestone substrates, but have been found in other soil types. Forages on decayed deciduous leaves and herbaceous plants (USDA Forest Service 2005a).

Predatory Species

The following species all prey upon small mammals or birds that are dependent on the lower vegetative strata and are analyzed together in this section: broad-winged hawk, Cooper's hawk, northern saw-whet owl, and sharp-shinned hawk. The Monitoring Birds of the Black Hills (MBBH) program provides a means to loosely track occurrences of the above species. More intensive and focused efforts involving call-response surveys to monitor raptors or night-time surveys to monitor the northern saw-whet owl would be needed to effectively monitor these species (USDA Forest Service 2008a, 2009a). Forest-wide monitoring suggests that progress is being made to achieve the desired condition for pine structural stages in Management Areas 4.1, 5.1, 5.4, 5.43, and 5.6. Additional time and effort is needed to achieve the structural stage percentages. Subsequently, habitat is being conserved for these predator species (USDA Forest Service 2008a, 2009a).

Broad-winged hawk *(Buteo platypterus)*
The broad-winged hawk is the most common woodland hawk throughout its range, but is rare in the Black Hills. In the Black Hills, this bird is associated with ponderosa pine in mixed pine and deciduous habitats, occasionally with a white-spruce component. The Forest's bird monitoring program has recorded this species mostly in the Bearlodge Mountains and the northern Black Hills (USDA Forest Service 2008a). This hawk hunts in a diversity of habitats, taking primarily a variety of small to mid-sized birds and mammals, but it is also an opportunistic raptor, and would feed on amphibians, reptiles, and insects. An active broad-winged hawk nest was found near Reno Gulch, making this pair the southernmost extent of this species' distribution in the Black Hills. The primary risk factor for this species appears to be habitat alteration or loss that decreases nest site availability (Stephens and Anderson 2003). This species has been documented in the Reno Gulch area adjacent to the Palmer Gulch Allotment.

Cooper's hawk *(Accipiter cooperii)*
The Cooper's hawk is uncommon but well-distributed in the Black Hills. This species is considered a habitat generalist, requiring mature forest with 60-90% canopy closure for nesting. This hawk usually nests in riparian, conifer, and aspen forests. Nest tree diameters are typically smaller than goshawk nest trees, although Cooper's hawks appear to select trees larger than what is randomly available. This hawk hunts in a diversity of habitats, taking a variety of small to mid-sized birds and mammals. In general, the species is more tolerant of human presence and habitat fragmentation than other accipiters. Habitat loss or alteration, predation, and prey availability appear to be the most threat to this species' persistence (Stephens and Anderson 2002, USDA Forest Service 2005a). This species has been documented in all of the allotments.

Northern Saw-whet owl *(Aegolius acadicus)*
There are few documented observations of the northern saw-whet owl in the Black Hills, but this may be attributable more to its nocturnal habits than to actual demographics. Monitoring indicates this species may be common throughout the Black Hills (Rocky Mountain Bird Observatory 2001-2009, Fauna West Wildlife Consultants 2003, Drilling 2010). The saw-whet is considered a habitat generalist usually found in coniferous and riparian forests. The species prefers mature forest, and selects large snag cavities excavated by primary cavity nesters (e.g., woodpeckers). The saw-whet owl often forages along forest edges, where it preys upon small mammals and birds. Limiting factors are availability of mature forests (structural stages 4C and 5) and nesting cavities (e.g., snags) within suitable breeding habitats (Johnson and Anderson 2003, USDA Forest Service 2005a). This species has been documented in all of the allotments (Drilling 2010).

Sharp-shinned hawk *(Accipiter striatus)*
This hawk occurs widely within the Black Hills, but it is also one of the rarest hawks here. Only a few nests have been documented on the Forest, primarily in conifer stands. Conifer stands of young age, with high tree density and high canopy closure have all been identified as potentially important breeding habitat parameters range-wide. This equates to white spruce and ponderosa pine in structural stages 3B and 3C. The sharp-shinned hawk preys upon numerous species of small animals, primarily birds. It is thought that foraging habitat for this hawk is represented by a variety of different vegetation conditions, especially those that provide a diverse prey base within their territories. Habitat loss or alteration, predation, and prey availability appear to be the most threat to this species' persistence (Stephens and Anderson 2002, Rocky Mountain Bird Observatory 2001-2009). This species has been documented on all of the allotments.

Direct and Indirect Effects to Predator Species:

Alternative A - No Action
Potential direct effects to predator species include nest disturbance and possible abandonment associated with fence removal activities. Potential indirect effects of removing 50% or more of annual herbaceous growth is eliminated, which would likely increase prey availability (improved prey productivity and survival), especially within riparian areas and meadows. Prey species may be harder to detect, however, due to increased cover. The overall available foraging habitat for predatory species would not change substantially if livestock grazing is no longer allowed on these allotments. However, foraging habitat would be enhanced and prey abundance would be increased with this alternative.

Alternative B
There are no direct effects expected to predator species from livestock grazing per se. Potential direct effects to these species could occur with associated activities, such as fence reconstruction/maintenance and water storage reconstruction/maintenance, if nest trees/snags were removed, or cause nest abandonment due to loss of habitat or disturbance. These could have a negative effect to these species if conducted during the nesting period. Indirect effects include the potential to remove 50% of annual herbaceous growth, which may reduce prey availability in forested environments, especially within riparian areas and meadows (Stephens and Anderson 2002, Stephens and Anderson 2003, Belsky et al. 1999, Giuliano and Homyack 2004). Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions (See riparian/aquatic MIS and ruffed grouse discussion).

Because of the large number of prey species that utilize riparian habitats, reduced grazing impact, and increased streambank stability, improvement in riparian vegetation extent and diversity, and restoration of hydrologic function would benefit prey species. However, grazing in riparian areas would still affect streambank stability and riparian vegetation more than Alternative A. Reduced prey abundance may affect reproductive and survival rates of predator species. However, loss of understory structure and composition would increase foraging effectiveness of predator species. Alternative B should provide adequate habitat for these species.

Alternative C
Direct and indirect effects to predator species are similar to the effects discussed under Alternative B. Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures, that would help achieve better distribution of livestock across the allotment pastures (see Alternative C riparian/aquatic MIS and ruffed grouse discussion). Construction of fences, water developments, and prescribed burning could cause loss of the nest trees or nest abandonment, and reduce foraging effectiveness for these species.

Because of the large number of prey species that utilize riparian and hardwood habitats, improvement in riparian vegetation composition and structure and hydrologic function would

benefit prey species. Upland utilization is expected to increase in areas where currently there is little or no use occurring, although this is not expected to have large effect on prey species. Adherence to Forest Plan standards, guidelines and utilization standards would protect these species from nest loss, reduce the potential for nest abandonment, and improve habitat for prey species more than Alternative B, but to a much lesser degree than Alternative A. All alternatives would be consistent with Objective 221, therefore these species are likely to persist.

Cumulative Effects to Predator Species

A variety of activities have affected the distribution and amount of habitat available for predator species and their prey. Past harvest activities have focused on opening the forest canopy and the removal of large diameter trees, which decreased habitat for those species dependent on large diameter, closed canopied stands used for foraging and nesting. Timber harvest, fuels treatments, and thinning have reduced within-stand structure needed for most nesting predator species. In addition, these activities have reduced the size and distribution of down wood habitat, which has affected prey species dependent on this habitat. Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Higher conifer densities have resulted in the decline of understory shrub and grass species, which may has likely impacted a variety of prey species. Conversely, beneficial effects to diverse foraging habitats have resulted from past and current removal of pine trees, prescribed burns, and wildfires. Riparian hardwood and grassland habitats have been enhanced by removing encroaching pine trees. Future removal of pine through vegetative treatments is expected. Effects would be similar to those previously described.

Historic livestock overgrazing, the loss of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development and the resulting degradation of the majority of stream channels and loss of water tables in the allotments have affected the function and potential for many riparian areas to support riparian shrub and hardwood communities. Drought conditions over the past decade have exacerbated the poor condition of most riparian areas. Ungulate browse and conifer encroachment has also led to the suppression of hardwood regeneration and development. Fire suppression has eliminated a primary disturbance agent for regeneration of aspen.

Wildfires in the Mystic Range Project area (e.g., Jasper and Horse Creek) increased grassland and hardwood cover, and have improved plant species diversity and available habitats in those areas. Fires have both enhanced and diversified some predator foraging habitat, but made other habitats too open, where predation by owls are more likely to occur. Future prescribed burns are expected to have mostly beneficial effects. Recreation use and motorized traffic may also cause nest disturbance and possible abandonment for accipiter hawks.

Livestock grazing and grazing by wild ungulates would continue to remove herbaceous and shrubby vegetation on private and forest land, affecting vegetation availability of cover, forage and nesting habitat for a variety of prey species. Alternatives B and C are expected to contribute to cumulative effects, but not to a greater degree than currently exists.

Insectivore Species

The following species are insectivorous species, and are analyzed together in this section: pygmy nuthatch, long-eared myotis, long-legged myotis, northern myotis, and small-footed myotis.

Pygmy nuthatch *(Sitta pygmaea)*
The pygmy nuthatch is an uncommon resident in the Black Hills and has been documented in a variety of ponderosa pine habitats, as well as in white spruce forests and recently burned areas. This nuthatch has been observed in late successional pine, but may not be limited to this habitat type in the Black Hills (Rocky Mountain Bird Observatory 2001-2009). This small bird is often associated with undisturbed old growth or mature pine stands. Large trees and snags (15-27" DBH) are preferred for nesting, foraging, and communal roosting. Limiting factors appear to be loss of available large diameter snags for nesting and roosting habitat, and availability of productive foraging habitat (Ghalambor and Dobbs 2006). The nuthatch feeds on ants, wasps, moths, beetles, grasshoppers, spiders, and pine seeds.

According to FPMER, the highest number of occurrences of pygmy nuthatch was recorded in 2007 and previous years. This species' population fluctuates yearly, and it has been observed more frequently in recent years, but its status is uncertain in the northern hills (USDA Forest Service 2008a, Tallman et al. 2002). Structural stage objectives for ponderosa pine are moving toward Forest Plan objectives, and along with stable to increasing snag availability forest-wide, indicates that the Forest is conserving and enhancing habitat for the pygmy nuthatch (USDA Forest Service 2009a). This species has been recorded in the Bald Horse Allotment.

SOLC Bats: Long-eared *(Myotis evotis)*, Long-legged *(Myotis volans)*, Northern *(Myotis septentrionalis)*, and Small-footed *(Myotis ciliolabrum)*
Each of these bat species has similar limiting factors, response to management actions, and applicable Forest Plan direction. Because of this, they are summarized here as a group, with major similarities and differences discussed below.

All four SOLC bats appear to be widely distributed throughout the Black Hills region (also see Tigner and Stukel 2003). Abundance varies between the species; the long-legged myotis may be the most common in the Black Hills, and the long-eared myotis is probably the least common. All four bats utilize coniferous and mixed coniferous/deciduous forests in the Black Hills and in other parts of their ranges. Flying insects, especially moths and beetles, are important prey items for these species. Roosts, considered the primary limiting factor, include very large trees (live and dead), caves, mines, and rocks. Roosts provide relatively stable temperatures and moisture patterns compared to nearby external environments (Schmidt 2003a-2003d, Tigner and Stukel 2003, USDA Forest Service 2005a). For these bat species, Forest-wide monitoring suggests roost protection and snag availability are stable to increasing, therefore the Forest is conserving and enhancing habitat for the SOLC bats (USDA Forest Service 2009a). These species have been documented on all of the allotments. Although research is lacking, grazing intensities that reduces vegetation height and species diversity would likely decrease prey availability, especially if prey species require specific plants for forage and oviposition. Loss of stagnant water sources would also reduce insect prey availability.

Direct and Indirect Effects to Insectivores:

Alternative A - No Action
There are no direct effects expected under this alternative. Overall available habitat for the pygmy nuthatch would not change substantially if livestock grazing is no longer allowed on these allotments. No grazing would likely improve foraging and watering habitat for bats by increasing prey availability and abundance, improving riparian vegetation cover and composition, increasing water tables, and stabilizing stream morphology. Beaver ponds where bats forage would likely remain on the landscape longer due to a lack of trampling. In areas where aggressive non-native species (e.g., smooth brome) occur, lack of grazing would increase the potential for non-native plants to replace native host and nectar plants for the bat's prey species. This alternative would likely provide the best habitat for their prey species compared to the action alternatives.

Alternative B
There are no direct effects expected to these insectivorous species from livestock grazing per se. Hibernacula, day roosts, maternity roosts, or snags would not likely be affected by the presence of livestock grazing. Direct effects to bats from associated range structures could occur, such as drowning in livestock watering tanks and being caught on barbed wire fences in flight. Potential direct effects to most bat species could occur as a result of associated activities, such as fence or water development reconstruction/maintenance that unintentionally remove nest trees/snags or roosts, and/or cause nest/roost abandonment due to loss of habitat or disturbance. These could have a negative effect to these species if conducted during communal roosting periods. Indirect effects for the pygmy nuthatch would be minimal. However, overgrazing facilitates the invasion on non-native annual grasses, which tend to be fire-adapted. The introduction and spread of cheat grass *(Bromus tectorum)* threatens the structure and function of native habitats. Spread of cheat grass may promote more frequent, larger, more severe, and less complex fires that are allowed by native vegetation (Ghalambor and Dobbs 2006) which could affect nesting habitat long-term.

Because of the large number of insect species that are found in riparian habitats, affects to riparian habitat would affect prey species (See Riparian/aquatic MIS section). Livestock grazing may indirectly effect riparian prey species that utilize understory to mid-story vegetation by trampling stream banks, removing vegetation, widening channels, aggrading channels, increasing temperatures and lowering the water table, all of which lead to reduced riparian shrub habitat (Boyle and Owens 2007, Jellison et al. 2007, Belsky et al. 1999, Finch et al. 1997, Kauffman et al 1983, Kauffman and Krueger 1984). Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. Current utilization patterns would continue or be adjusted based on annual monitoring results, and other factors (e.g., drought, fire) on a pasture by pasture basis. In general, upland areas would continue to receive disproportionate use when compared to riparian areas which would be expected to benefit prey species that utilize upland habitats. In both the upland and riparian areas, understory structure can influence the abundance and availability of many species of insects including Coleoptera, Lepidoptera, and Orthoptera by removing vegetative cover necessary for shelter, breeding, and feeding. Because of the large number of prey species that utilize riparian habitats, reduced grazing impact, and increased streambank stability, improvement in riparian vegetation extent,

diversity, and restoration of hydrologic function would benefit prey species. In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C.

Open water (unobstructed) sources are necessary for bats to obtain water on the wing. Wet areas around ponds, seeps, wet meadows, and springs support the insects on which bats forage. Management practices that alter wet areas (ponds, seeps, springs, and wet meadows), hydrology, and vegetative cover and composition would have a great effect on foraging bats (Gruver and Keinath 2006). However, often these species can switch from one source of insect prey to another as these sources become available.

Grazing in riparian areas would still affect stream bank stability and riparian vegetation more than Alternative A. These effects are similar to Alternative C. Reduced prey abundance may affect reproductive and survival rates of insectivore species. However, loss of understory structure and composition would increase foraging effectiveness of insectivore species. Alternative B should provide adequate habitat for these species.

Alternative C

Direct and indirect effects to insectivore species are similar to the effects discussed under alternative B. Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures, that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. Off-site water developments and relocation of watering structures appear to be an important tool to encourage livestock to move away from riparian areas (Ehrhart and Hansen 1997). Where riparian exclosures are created, these non-grazed areas would likely improve riparian conditions similar to Alternative A. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B (See riparian/aquatic MIS discussion).

Hibernacula, day roosts, maternity roosts, or snags should not be affected by the presence of livestock grazing. Additional indirect effects under this alternative could be caused by activities related to livestock grazing, such as construction of fences and water developments and prescribed burning activities, that could cause loss of nest trees or roost sites, cause nest/roost abandonment, and reduce foraging effectiveness for these species. Indirect effects for the pygmy nuthatch would be minimal, except that prescribed burning in the Porcupine allotment could decrease the pygmy nuthatch's preferred habitat (snags/old growth) (Ghalambor and Dobbs 2006).

Because of the large number of insect prey species that are found in riparian habitats, improvement in riparian vegetation composition and structure and hydrologic function would benefit insectivore species. Upland utilization is expected to increase in areas where currently

there is little to no use occurring, although this is not expected to have a large effect on insectivore species. Adherence to Forest Plan standards, guidelines and utilization standards should improve habitat for insectivores and their prey in this alternative similar to Alternative B, but to a much lesser degree than Alternative A, therefore these species are likely to persist.

All alternatives would be consistent with Objective 221.

Cumulative Effects to Insectivore Species

Past activities on private and public land have affected the distribution and amount of habitat available for the pygmy nuthatch and SOLC bats, and for their prey species. Changes in private land from agricultural purposes to residential development has reduced habitat for these species not only on private but on adjacent forest land. Past fuel reduction projects have included removal of standing and downed wood within 200 feet of private land, construction of fuel breaks, thinning old growth stands adjacent to private land, and prescribed burning, all of which likely reduce habitat for these species.

Past harvest activities have focused on opening the forest canopy and removal of large diameter trees, decreasing habitat for those species dependent on large diameter closed-stand conditions for foraging, nesting, and roosting. Timber harvest, fuel treatments, and thinning have also reduced the number of dead/dying trees and snags that provide roosting habitat for these species. Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Higher conifer densities have resulted in the decline of understory shrub and grass species, which may have affected a variety of prey species. Conversely, beneficial effects to diverse foraging habitats have resulted from past and current removal of pine trees, prescribed burns, and wildfires. Riparian hardwood and grassland habitats have been enhanced by removal of encroaching pine trees. Future removal of pine through various vegetative treatments is expected. Effects would be similar to those previously described.

Historic livestock overgrazing, decline of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development and the resulting degradation of the majority of stream channels and loss of water tables in the allotments have affected the function and potential for many riparian areas to support riparian shrub and hardwood communities. The loss of hydrologic function has reduced riparian species, such as green ash, cottonwood, aspen, birch, and willow, to isolated patches and fragmented habitat. Drought conditions over the past decade have exacerbated the poor condition of most riparian areas. Ungulate browsing and conifer encroachment has also led to the suppression of hardwood regeneration and development. Management practices that alter wet areas (ponds, seeps, springs, and wet meadows), hydrologic function, and vegetative cover and composition are likely to continue on both forest and private land. This would reduce foraging habitat for SOLC bats.

Livestock grazing and grazing by wild ungulates would continue to remove herbaceous and shrubby vegetation on both private and forest land, which would affect insect availability for these species. Alternatives B and C are expected to contribute to cumulative effects, but not to a greater degree than currently exists.

Riparian Dependent Species

The following species are dependent on riparian habitat/vegetation, and are analyzed together in this section: black-and-white warbler, meadow jumping mouse, Atlantis fritillary butterfly, tawny crescent butterfly, and the American dipper.

Black-and-white warbler *(Mniotilta varia)*
The black-and-white warbler breeds in mature deciduous forests of the eastern United States and throughout Canada. The Black Hills is at the edge of the black-and-white warbler's range in the United States. In the Black Hills, this warbler uses mature aspen stands, bur oak woodlands, and forested riparian areas (Rocky Mountain Bird Observatory 2001-2009, Tallman et al. 2002). Nests are placed on or near the ground and are well concealed at the base of a stump, log, or rock (Kricher 1995). Grazing has been attributed to a reduction in nest success and loss of insect prey species (Finch et al. 1997). This species forages on insects and spiders. It is a rare breeder in the Black Hills, with breeding records confirmed in South Dakota (Tallman et al. 2002, Rocky Mountain Bird Observatory 2001-2009). Habitat fragmentation of hardwood forests in the eastern United States has been identified as the main threat to this species (NatureServe 2009).

Limited observations of this species during Forest bird monitoring do not provide adequate data to determine densities (Rocky Mountain Bird Observatory 2001-2009). There are no population trends available from breeding bird survey routes in the Black Hills or in South Dakota (Sauer et al. 2008). In terms of habitat availability, progress is being made to achieve the desired condition for bur oak (Objective 201); subsequently, habitat is being conserved for this species (USDA Forest Service 2009a). Overall, black-and-white warbler populations are stable throughout North America (Sauer et al. 2008). This species has been documented in the lower elevations of the Bald Horse Allotment.

Meadow jumping mouse *(Zapus hudsonicus campestris)*
This subspecies occurs in the Black Hills and its range is thought to be limited to mountainous portions of eastern Wyoming and western South Dakota (Cryan 2004, Cryan and Ellison 2005, King et al. 2006). This species was found to be relatively common in riparian habitat sampled in the Black Hills (Krueger 2004). The meadow jumping mouse is strongly associated with riparian and meadow habitats that occur along small streams. A dense understory of deciduous shrubs, grasses, forbs, and downed wood are often present. The mouse's diet varies, and includes seeds, berries, leaves, buds, fungi, and insects. This dense, diverse understory requirement in riparian areas may limit the species' distribution and abundance (Cryan 2004, Cryan and Ellison 2005, Duckwitz 2001).

Domestic animal overgrazing, which consistently removes dense vegetation along creeks in eastern Wyoming, is thought to have contributed to this species' scarcity (Schulz and Leininger 1991, Griscom et al. 2008). Meadow jumping mice tend to occur in relatively low abundance and it is uncertain whether current abundance is different than the past. In Wyoming, as livestock utilization increases, meadow jumping mouse abundance decreases (Griscom et al. 2008). Fragmentation of appropriate riparian habitat may limit this species' ability to disperse.

No Forest-wide monitoring data on riparian resource condition was collected in FY 2008. Implementation of Forest Plan standards and guidelines, Regional watershed conservation practices, and best management practices maintain riparian habitat Forest-wide, but probably at a level less than its full capability. Progress is being made in achieving Objective 214 (USDA Forest Service

2009a). Projects to restore riparian and wetland habitat or to rehabilitate stream reaches have increased in the last five years which could partially indicate trend of jumping mouse habitat. These projects have a small positive influence on the habitat trend for these mice to meet the intent of Objective 221. Limited data suggest that the Forest is conserving habitat for the meadow jumping mouse (USDA Forest Service 2009a). This species likely occurs on all of the allotments since it was commonly found in riparian zones sampled (Cryan and Ellison 2005).

SOLC Butterflies: Atlantis Fritillary *(Speyeria atlantis pahasapa)* and Tawny Crescent *(Phycoides batesii)*

These two species have similar limiting factors, response to management actions, and applicable Forest Plan direction. Because of this, they are summarized here as a group. In South Dakota, both species are restricted to the Black Hills. Both of these butterflies are associated with meadows and riparian areas, particularly when found adjacent to each other (meadows along a stream). Specific plant species are important to each butterfly for nectar supplies and/or larval hosts. The Pahasapa fritillary is most dependent on violets, and the tawny crescent is most closely associated with smooth aster, dogbane, and other composites. These butterflies have been documented feeding on noxious weed species, such as leafy spurge and Canadian thistle. Limiting factors include the loss of nectar and larval host species through habitat loss and invasive species (Marrone 2002, 2005, 2006, 2007). Stefanich (2001) hypothesized that the limiting factor in the Black Hills is the destruction of this butterfly's habitat or isolation of colonies to the extent that populations are unable to disperse. These butterflies have been documented in most of the allotments. However, the Pahasapa fritillary is found primarily along riparian areas in the higher elevations of the Black Hills.

No Forest-wide monitoring data on riparian resource condition was collected in FY 2008. Implementation of Forest Plan standards and guidelines, Regional watershed conservation practices, and best management practices maintain riparian habitat Forest-wide, but probably at a level less than its full capability. Progress is being made in achieving Objective 214. Projects to restore riparian and wetland habitat or to rehabilitate stream reaches have increased in the last five years, which could partially indicate trend of butterfly habitat. These projects have a small positive influence on the habitat trend for these butterflies to meet the intent of Objective 221 (USDA Forest Service 2009a).

American Dipper *(Cinclus mexicanus)*

The American dipper is uncommon and isolated to clear, fast-flowing streams in the Black Hills. Dipper populations in South Dakota are declining, hence given state status of threatened. The South Dakota Department of Game, Fish, and Parks monitor dippers during the breeding and winter seasons (Backlund 2007). The Forest's bird monitoring program has recorded this species in Spearfish Creek and several of its tributaries, but it has also been found in other streams (e.g., Bear Butte, Elk, Iron, Spearfish, Little Spearfish, East Spearfish, Whitewood, French, and Rapid Creeks). DNA analyses suggest that the Black Hills dipper population may be genetically distinct from other populations (USDA Forest Service 2008a, Backlund 2007). The USDI Fish and Wildlife Service recently announced is 90-day finding on a petition to list the Black Hills population as a distinct population segment (DPS). Based on their review, the USDI Fish and Wildlife Service concluded that this population is not a listable entity under the Endangered Species Act (USDI Fish and Wildlife Service 2009b).

This bird usually nests within 25 feet of streams on rocky ledges, cliffs, boulders, and bridges. It feeds primarily on aquatic insects and insect larvae caught while diving underwater. The primary risk factor for the dipper appears to be flow reductions, degraded water quality due to sedimentation, and other pollutants that affect prey availability. Limiting factors include prey availability, suitable winter habitat, stream connectivity, and availability of nest sites (Anderson 2002). Nesting attempts in Spearfish Creek have remained fairly stable, and nesting success has increased, but additional monitoring is needed to determine long-term trends. Nesting attempts and success have declined in Whitewood Creek, although the cause of this decline is unknown. Additional monitoring would determine the long-term trend. Over-grazing has a negative effect on dippers. Birds were absent in areas with stream damage from heavy grazing in a Montana study (Osborn 1999). Fleischner (1994) reviewed the effects of livestock on riparian areas, including: changing or removing streamside vegetation, increasing sedimentation due to erosion, and changing water chemistry and temperature. The dipper has been documented in the Bald Horse and Palmer Gulch Allotments along Rapid Creek and Sunday Gulch, but these observations are sporadic. There is no indication that the American Dipper has successfully nested in the MRP area.

Direct and Indirect Effects to Riparian Dependent Species:

Alternative A - No Action

There are no direct effects expected under this alternative, therefore the possibility of mortality due to livestock grazing is eliminated. Indirect effects include raising the water table, increased water quantity and quality, decreased water temperature, and increased herbaceous vegetation for nesting and concealment cover. Understory grasses and forbs would increase, as would riparian shrubs, such as willow. The overall available habitat would improve if livestock grazing is no longer allowed on these allotments. Flowering plant species, needed for nectar and larval host plants (e.g. violets and asters) for butterflies, would be more available in the absence of grazing. Where non-native grasses (e.g., smooth brome) occur, flowering plants may decline in the absence of grazing. However, increases in water table would likely limit the spread of non-native invasive grasses long-term. Improvements in riparian vegetation composition, structure, and stream hydrology/morphology would likely decrease sediments and provide for cooler water temperature. This would increase aquatic invertebrate prey for the dipper. Lack of grazing would provide cover for the meadow jumping mouse. This alternative would provide habitat for riparian species at an increased rate compared to Alternatives B and C.

Alternative B

Direct effects from livestock grazing include potential mortality of adult jumping mice and their offspring due to trampling of nests and burrows, knocking young out of nests or beds, crushing warbler and dipper eggs or chicks, butterfly larvae or cocoons, or covering larvae, eggs, chicks or young with manure. Grazing has been shown to decrease small mammals in riparian areas (Belsky et al. 1999, Giuliano and Homyack 2004). Schulz and Leininger (1991) documented that the meadow jumping mice dominated un-grazed sites whilst the deer mouse dominated grazed sites. Livestock grazing may indirectly affect riparian species that utilize understory to mid-story vegetation for cover, feeding or building nests by consuming vegetation and trampling the stream bank and vegetation, compacting soil, removing required cover, widening channels, aggrading channels, increasing water temperatures, reducing water quality, and lowering the water table leading to reduced riparian shrub land habitat (Belsky et al. 1999, Bock et al. 1992, Kauffman et al. 1983, Kauffman and Krueger 1984). For ground nesting birds, such as the black-and-white warbler

and dippers, removal of vegetation adjacent to a nest can increase the risk of predation on eggs or chicks (Ammon and Stacey 1997, Backlund 2007). Decreased water quality and higher water temperatures would decrease aquatic invertebrate prey for the dipper (Feck and Hall 2004).

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. However, direct and indirect effects, such as dipper and warbler egg loss, nest disturbance, breakdown of beaver dams and loss of essential nectar and larval host plants, would likely occur, similar to Alternative C. Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability and extent and diversity of riparian vegetation, more than Alternative A (see riparian/aquatic MIS Alternative B discussion).

In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C.

Movement toward meeting desired condition that would improve habitat for riparian dependent SOLC species would depend upon the permittees' commitment to keep livestock away from riparian areas. Implementation of riparian utilization standards would improve habitat conditions for riparian dependent SOLC species from existing. Alternative B should provide adequate cover and water for these species, but to a lesser degree than Alternative A.

Alternative C

Direct effects and indirect effects to the black-and-white-warbler, meadow jumping mouse, SOLC butterflies, and the American dipper are similar to the effects discussed under Alternative B.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. Off-site water developments and relocation of watering structures appear to be an important tool to encourage livestock to move away from riparian areas (Ehrhart and Hansen 1997). Where riparian exclosures are created, these non-grazed areas would likely improve riparian conditions similar to Alternative A. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B.

Adherence to Forest Plan standards, guidelines and utilization standards should protect riparian nesting birds, maintain adequate nectar and host plants for butterflies, and maintain adequate cover habitat for the meadow jumping mouse similar to Alternative B, but to a much lesser degree than Alternative A. Direct and indirect effects such as dipper and warbler egg loss, nest disturbance, breakdown of beaver dams, and loss of essential nectar and larval host plants would likely occur, similar to Alternative B.

Although livestock grazing in riparian areas would be reduced, grazing would still affect streambank stability, extent, and diversity of riparian vegetation, more than Alternative A (See riparian/aquatic MIS Alternative C discussion). Prescribed burning in the Porcupine Allotment would not affect these species, due to the lack of riparian habitats and stream courses.

Movement toward meeting desired condition that would improve habitat for riparian dependent SOLC species would depend upon the permittees' commitment to keep livestock away from riparian areas. Implementation of riparian utilization standards would improve habitat conditions for riparian dependent SOLC species from existing. Alternative C should provide adequate cover and water for these species, but to a lesser degree than Alternative A.

All alternatives would be consistent with FP standards and guidelines, and Objective 221; therefore these species are likely to persist.

Cumulative Effects to Riparian Species

Historic livestock overgrazing, the loss of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development and the resulting degradation of the majority of stream channels and loss of water tables in the allotments have affected the function and potential for many riparian areas to support riparian shrub and hardwood communities. The loss of hydrologic function has reduced riparian species such as green ash, cottonwood, aspen, birch, and willow species to isolated patches and fragmented habitat. The drought conditions over the past decade have exacerbated the poor condition of most riparian areas. Browsing by ungulates and conifer encroachment has also led to the suppression of hardwood regeneration and development.

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Higher conifer densities have resulted in decreased water to riparian habitat and thus negatively affected riparian areas. Fire suppression has eliminated a primary disturbance agent for regeneration of aspen. Conversely, beneficial effects to riparian habitats have resulted from past and current removal of conifer, prescribed burns, and riparian restoration projects. Riparian hardwood and grassland habitats have been enhanced by removing encroaching conifers. Future removal of pine through various vegetative treatments is expected. Effects would be similar to those previously described.

Stand replacing wildfires have increased grassland and hardwood communities, but have negatively affected riparian areas in those burns. Sedimentation and changes in stream morphology and hydrology have affected water temperatures, pH, and water quality needed for aquatic invertebrates. These changes may influence distribution of riparian dependent species, especially the American dipper. Future prescribed burns are not expected to have the adverse effects associated with high intensity, high severity wildfires.

Improper road/trail location and recreation use (motorized vehicles) have negatively affected some aquatic habitats through trampling of vegetation, increasing sedimentation, destabilizing banks, and facilitated the spread of noxious weeds. These effects are likely to continue. However, the Black Hills National Forest is in the process of determining a forest-wide travel management plan, which would eliminate motorize travel off-road, limit motorized use to specific areas/roads, and limit use periods which should improve stream habitat.

Land use on private land increases the potential for loss of hydrologic function in many of the allotment riparian areas. Road construction, water impoundments, wells, draining of wetlands, clearing and development would likely continue to impact water availability, and reduce habitat for riparian dependent species.

Livestock grazing and grazing by wild ungulates would continue in riparian areas on both forest and private land. For SOLC butterflies, there is a risk that host plants, larvae, or pupae may be consumed or trampled. American dipper nests would also be affected. Overgrazing on both forest and private land would have a negative effect on these riparian dependent species as well as their habitat. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

SOLC Snails: Callused Vertigo *(Vertigo arthuri)*, Frigid Ambersnail *(Catinella gelida)*, Mystery Vertigo *(Vertigo paradoxa)*, and Striate Disc *(Discus shemekii)*

Gastropods are typically found in well-developed litter (but not thick or fungus matted) with very rich and comparatively wet, loose soil. Most sites have dense overstory and a deciduous component. Snail colonies in the Black Hills have patchy distribution (Frest and Johannes 1993, 2002). This may be due to habitat preferences, foraging requirements, and/or hostile environmental conditions. Some snail species can tolerate somewhat dryer site conditions, where others may not. Most snail species prefer calcareous substrate materials, but others (e.g., *Vertigo spp.*) have been found in other soil types (Frest and Johannes 1993, 2002, and Anderson 2004a, 2004b). Snails are generally susceptible to activities that change the temperature and moisture at the soil or litter level. Additional microhabitat conditions such as soil type, amount and type of plant ground cover, soil pH, depth and type of litter, and amount of cover from rocks or woody debris also play a role in where these snails can survive. Research indicates low snail diversity may be due to changes in the moist microclimate (lack of moss/lichen), increased environmental effects, and loss of overstory cover which creates drier site conditions that are detrimental to land snails (Anderson 2004a, 2004b). Threats to gastropods include loss of suitable habitat, predators, desiccation, soil compaction, trampling, and barriers to dispersal (Anderson 2004a, 2004b). Frest and Johannes (2002) identified that these snails are affected by roads (and their associated activities), livestock trampling, and timber harvesting.

Recently, the USDI Fish and Wildlife Service made a positive 90-day finding that the frigid ambersnail may warrant listing under the Endangered Species Act (USDI Fish and Wildlife Service 2009). The USDI Fish and Wildlife Service determined that substantial information exists that listing may be warranted due to the present or threatened destruction, modification, or curtailment of the frigid ambersnail's habitat or range resulting from the effects from roads, livestock trampling, and logging disturbances. The USDI Fish and Wildlife Service is currently undertaking a 12-month status review. The *Vertigo* species have been documented in and/or adjacent to most of the allotments, associated primarily with riparian areas and spring/seeps. Due to their small size, these species are often overlooked. The striate disc has been found in and adjacent to the Palmer Gulch, Deerfield, Rimmer, Redfern, and Slate Prairie Allotments. The frigid ambersnail is difficult to identify but has been found in the Palmer Gulch Allotment and adjacent to the Redfern and Deerfield Allotment.

Monitoring for these species was not funded in 2008. Forest Plan standard 3103 requires known SOLC snail colonies to be managed to retain favorable site conditions and to avoid/minimize the effects of land management activities to protect SOLC snails and their habitat. Subsequently,

habitat is likely to be conserved for these species consistent with Objective 221 (USDA Forest Service 2009a).

Direct and Indirect Effects to SOLC Snails:

Alternative A - No Action
No direct effects to SOLC snails are expected under this alternative due to mortality caused by livestock trampling. Springs and seeps, where the *Vertigo ssp*. is likely to occur, would not be trampled, thereby allowing colonies to expand. Indirect effects include raising water tables, increasing water quantity and quality, decreased water temperature, and increased herbaceous vegetation that would protect snails from desiccation. The lack of grazing should provide more overstory vegetation which may increase snail dispersal. However, other factors (e.g., slope, exposure, soil, habitat type) play more of a role in SOLC snail patterns of movement. Overall, available habitat for SOLC snails would improve if livestock grazing were no longer allowed on these allotments. This alternative would improve habitat for riparian snail species at an increased rate compared to Alternatives B and C.

Alternative B
Direct effects include potential mortality to snails caused by livestock trampling through colonies and a reduction in vegetation that increases radiant heat and wind to colonies causing desiccation. Livestock grazing may have indirect effects to snails that are dependent on wet areas (*Vertigo ssp.),* streamside habitats, and/or hardwood stands by reducing moist micro-climates required by snails, reducing hardwood regeneration, trampling vegetation, and lowering the water table, all of which lead to reduced riparian habitat (Anderson 2004a, 2004b, Belsky et al. 1999, Jellison et al. 2007). Livestock grazing reduces understory and midstory vegetation, which allows more sunlight and wind to dry out moist habitats, altering litter/duff depth and decay processes (Frest and Johannes 2002). Removal of vegetation in and adjacent to snail colonies may also make snails more vulnerable to predation. Frigid ambersnail and striate disc snail colonies are usually found on steeper northerly aspects that are rarely traversed by livestock, thus colonies of these two snail species are less affected by livestock grazing. Some protection of springs/seeps from livestock trampling would protect some colonies of *Vertigo ssp*.

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. In general upland areas would continue to receive disproportionate use when compared to riparian areas which would be expected to affect the striate disc and frigid ambersnail that utilize upland habitats. In both the upland and riparian areas, the loss of herbaceous understory structure can influence snail dispersal and colony expansion by removing vegetative cover necessary for shelter, breeding, and feeding. Since snail species are dependent on mesic habitat, reduced grazing impact, and increased streambank stability, improvement in riparian vegetation extent, diversity and restoration of hydrologic function would benefit these snails. However, grazing would still occur affecting their habitat more than Alternative A. These effects are similar to Alternative C.
In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue

to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C. Alternative B should provide adequate habitat for these species.

Alternative C

Direct and indirect effects to SOLC snail species are similar to the effects discussed under Alternative B.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures, that would help achieve better distribution of livestock across the allotment pastures. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B.

Additional direct effects to these snails may come from prescribed burning, construction of new water developments, and changes in livestock distribution from active livestock management. Protection of springs/seeps from livestock trampling would protect some colonies of *Vertigo ssp.*

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. In general upland areas would continue to receive disproportionate use when compared to riparian areas which would be expected to benefit the striate disc and frigid ambersnail that utilize upland habitats. As in Alternative B, grazing would still occur in uplands and riparian areas, affecting herbaceous cover, stream bank stability, and riparian vegetation more than Alternative A. Alternative C should maintain or improve suitable habitat for the SOLC species, but to a much lesser degree than Alternative A.

Prescribed burning proposed in the Porcupine Allotment could result in loss of snail colonies on drier sites, or reduce colony size to pockets of moist habitat (unburned areas), depending on intensity and severity of the fire. However, snail colonies in this allotment have already been affected by the Jasper Fires of 2000. As a result, remnant populations may be restricted to narrow niches surrounded by inhospitable habitat in the fire area.

All alternatives would be consistent with FP standards and guidelines, and Objective 221; therefore these species are likely to persist.

Cumulative Effects to SOLC Snails

There is no known evidence that the Black Hills was a stable ecosystem dominated by mature, dense conifer forests, especially in a ponderosa pine ecosystem. Evidence suggests that the Black Hills is ever-changing from the effects of fire, insect outbreaks, drought, and human disturbances (USDA Forest Service 1996b). This fire dominated ecosystem has had the biggest effect on SOLC snail colonies, in terms of numbers and distribution. Insect epidemics along with stand replacing wildfires historically increased open areas that may drastically alter or eliminate these snail species' habitat for long periods (e.g., >50 years). Over the past century,

however harvest activities, forest succession, and fire suppression have resulted in a much denser forest condition than occurred historically. Higher conifer densities have resulted in a loss of mesic hardwood habitats and decreased hydrologic function in bottomlands, ultimately reducing the quantity and quality of habitat available for some land snails.

Historic livestock overgrazing, the loss of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development which resulted in degradation of the majority of stream channels and lowering of water tables have affected the function and potential for many riparian areas to support riparian shrub and hardwood communities. Loss of hydrologic function has reduced riparian species to isolated patches and fragmented habitat, which has also limited the size of snail colonies and their ability to disperse. The drought conditions over the past decade have exacerbated the poor condition of most riparian areas. Browsing by ungulates and conifer encroachment has also led to the suppression of hardwood regeneration and development, which affects moist understory vegetation, litter layer and decay processes that snails require. Management activities such as timber harvest, thinning, fuel treatments, and prescribed fire likely result in increased solar radiation, altered mesic site conditions, a reduction in down woody material, and disturbed ground cover. These activities are likely to affect snail colony expansion and increase isolation between colonies.

Livestock grazing and grazing by wild ungulates would continue to remove herbaceous and shrubby vegetation on both private and forest land especially in riparian areas and hardwoods, which would direct and indirectly affect SOLC snails and their habitat. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Northern Flying Squirrel *(Glaucomys sabrinus)*

The flying squirrel resides in a variety of forested habitats including pure ponderosa pine and pine mixed with aspen, birch, or spruce in the Black Hills (Krueger 2004). This species is well dispersed across the forest but is found primarily in the northern and central hills (Krueger 2004, Hough 2008). The species is nocturnal and utilizes mostly spruce and mature pine (SS 3C and 4) for foraging habitat, and snags for denning in the Black Hills (Hough 2008). Flying squirrels consume a varied diet, including fungi, lichens, seeds, insects, and bird eggs (Higgins et al. 2000). They nest and shelter in cavities of large trees, snags, and in small structures (dreys) that they build from twigs, bark, and roots. The flying squirrel tends to avoid large openings and early seral pine stages, which may prevent crossing small openings by gliding from one tree to the next (Hough 2008, Duckwitz 2001).

Turner (1974) noted that the highest densities of flying squirrels are likely found in white spruce forests in moist canyons of the northern Black Hills. Hough (2008) found that the highest densities were found where habitat features, such as snags, dead/down material, and a moist microclimate with fungi were most abundant. Aspen/birch stands were important denning habitat but avoided for foraging habitat (Hough 2008). This species has been documented in the Tigerville, Palmer Gulch, Bald Horse, and Deerfield Allotments.

The Forest is conserving habitat for the northern flying squirrel in regards to spruce habitat, but progress towards increasing the proportion in structural stage 5 and the very large tree component in Management Areas 5.4 and 5.43 is still needed to enhance habitat (USDA Forest Service 2009a). Hough (2008) determined that the population appeared to be stable.

Direct and Indirect Effects to Northern Flying Squirrel:

Alternative A - No Action
Flying squirrels can be killed while gliding if they get wrapped around barbed wires in flight or land in stock tanks. Stock watering tanks can cause drowning mortalities, especially if there is no escape ramp. Fences and stock tanks may still exist with the potential for mortality if these are not removed. Indirect effects to foraging habitat from livestock grazing would be eliminated. The overall available foraging habitat along riparian/moist bottomlands would likely improve by reducing the negative effects of grazing on wetlands. Concealment cover near the ground would also be enhanced.

Alternative B
No direct effects would be anticipated from livestock grazing because of the mobility of this species. However, direct effects to this squirrel from associated range structures could occur, such as drowning in livestock watering tanks and being caught on barbed wire fences in flight. Livestock grazing does not normally alter tree stand structure, patch size, or affect availability and condition of snags but heavy grazing can impede hardwood regeneration. Indirect effects to this squirrel may include loss of foraging habitat due to over use in riparian area and moist micro-climates that affect food sources (e.g., fungi), and increased potential of predation in riparian areas due to reduced vegetative cover. Loss of nest trees and dreys may occur during fence maintenance/reconstruction. Indirect effects may also include loss of preferred food items (fungi) due to trampling, and reduced understory vegetation and structure, especially in riparian habitats. Loss of concealment cover near the ground likely increases potential for predation.

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. In general upland areas would continue to receive disproportionate use when compared to riparian areas which would be expected to affect prey species that utilize upland habitats. In both the upland and riparian areas, the loss of understory structure and trampling can influence the abundance and availability of fungi species. In addition, browsing of hardwoods could reduce regeneration of these species, limiting nesting and foraging habitat. Reduced grazing impact and increased streambank stability, improvement in riparian vegetation extent, diversity, and restoration of hydrologic function would benefit this species. However, grazing in riparian areas would still affect stream bank stability and riparian vegetation more than Alternative A. These effects are similar to Alternative C. Reduced food availability, especially in mesic habitats could affect reproductive and survival rates of the northern flying squirrel.

In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function would continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). These site-specific areas of concern would improve at a much slower rate as compared to Alternative A and Alternative C. Alternative B should provide adequate habitat for this squirrel.

Alternative C
Direct and indirect effects are expected to be similar to those described for Alternative B. Livestock management options available in Alternative B would be the same in Alternative C. In

addition, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B. Upland utilization is expected to increase in areas where currently there is little to no use occurring, although this is not expected to have an effect on the flying squirrel. Prescribed burning in the Porcupine Allotment would not likely affect this species in this already open habitat. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate foraging and cover habitat for this squirrel similar to Alternative B but to a lesser degree than Alternative A.

All alternatives would be consistent with FP standards and guidelines, and Objective 221; therefore these species are likely to persist.

Cumulative Effects to Northern Flying Squirrel:

Vegetative treatments that focused on opening the forest canopy and removing large diameter trees, decreased habitat for those species dependent on large diameter, closed stand conditions for foraging and nesting. Timber harvest, fuel treatments, prescribed burning, and thinning have also reduced dead/dying trees and snags that provide roosting habitat for the flying squirrel. Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Such treatments have likely had mixed results by increasing late successional characteristics but resulted in the decline of hardwood stands, understory shrubs and grasses, which may have affected a change in a variety of food items. Beneficial effects to diverse foraging habitats have resulted from past and current removal of conifers and prescribed burns that have increased the potential for fungi growth on down wood material. Riparian hardwood and grassland habitats have been enhanced by removing pine trees. Future removal of pine through various vegetative treatments is expected. Effects would be similar to those previously described.

Historic livestock overgrazing, the loss of beaver, road construction, timber harvest activities, recreation use, mining activities, and land development which resulted in degradation of the majority of stream channels and lowering of water tables in the allotments, have reduced the potential for many riparian areas to support riparian shrub and hardwood communities. The past drought conditions have exacerbated the poor condition of most riparian areas. Management practices that alter wet areas (ponds, seeps, springs, and wet meadows), hydrologic function, and vegetative cover and composition are likely to continue on both forest and private land.

Livestock grazing and grazing by wild ungulates would continue to remove herbaceous and shrubby vegetation on both private and forest land, which would affect food availability for these squirrels. Alternatives B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Rocky Mountain Bighorn Sheep (*Ovis canadensis*)

The Rocky Mountain Bighorn Sheep was recently added to the R2 Sensitive species list. To reduce redundancy, most life history, current condition, and predicted effects information are provided in the Mystic Range Project Biological Evaluation document. Bighorn sheep are found in the Palmer Gulch, Bald Horse, Redfern, and Tigerville Allotments (J. Kanta, South Dakota Game, Fish, and

Parks, Pers. Comm.). All alternatives would be consistent with FP standards and guidelines, and Objective 221; therefore these species are likely to persist.

Mountain Goat *(Oreamnos americanus)*
The mountain goat is distributed from southeast Alaska through the Canadian Rockies to various mountain ranges in the northern United States. The goat was introduced to the Black Hills in 1924, and became established in only one area: the Black Elk Wilderness and Norbeck Wildlife Preserve region.

The mountain goat is typically found in alpine and subalpine habitats, which straddle the natural tree line. Neither of these high elevation habitats (or a tree line) exists in the Black Hills. Here, the species occupies among the highest and rockiest habitats available to it, including pine and spruce covered slopes. The bulk of the mountain goat population in the Black Hills occurs largely within the Black Elk Wilderness and the Norbeck Wildlife Preserve (Griebel et al. 2007). Current mountain goat populations are smaller than estimates by Richardson (1971). Mountain goats utilize a variety of forage plants in the Black Hills, including chokecherry, buffaloberry, grasses and sedges, aspen, serviceberry, wild rose, willow, and hazel (USDA Forest Service 2005a). Some literature suggests that during the summer, mountain goats feed mostly on grasses and sedges, herbaceous plants and willow, but their diet becomes variable during the winter, ranging from grasses to mosses, lichens, and woody vegetation (Rideout and Hoffmann 1975). Hardwood forests, meadows, and riparian areas are particularly important because these are the sites that produce the most forage (e.g., aspen and various shrubs). Usually the most available forage rather than the most palatable forage is consumed (Richardson 1971). Regardless, most of the forage plants listed above require at least moderate levels of sunlight, such as is found under open or moderately open tree canopies. Riparian areas and open grassland would likely provide summer and winter forage (grasses and sedges). Although difficult to ascertain, competitors for forage resources likely include elk, deer, bighorn sheep, and livestock. There is no evidence that suggests competition for forage between livestock and mountain goats may be causing a decline in goat numbers in the Black Hills. However, less than 5% of mountain goat range is used exclusively by goats, which includes the highest rocky peaks of the Norbeck Wildlife Preserve and Black Elk Wilderness area (Richardson 1971). Therefore, overlap of forage sources between other ungulates in the remaining portion of their range is likely. Water availability for mountain goats does not appear to be a limiting factor for this species due to snow pack and terrain (Rideout and Hoffmann 1975).

The SDGFP administers a hunting season on this population, but the harvest season has been closed since 2006. The original herd of six transplanted animals grew to an estimated 300-400 animal by 1971, but a 2007 survey suggests a current population of only 60 goats. The cause of this decline is unknown. Some possibilities include high predator (mountain lion) numbers, genetics, and/or possible habitat loss (USDA Forest Service 2008a). The Forest continues to coordinate with the SDGFP to determine if more specific habitat management actions are needed to conserve/enhance habitat for this species (USDA Forest Service 2004, 2007). Mountain goats have been documented in the Palmer Gulch Allotment (Palmer and Rabbit pastures) and one stray was reported adjacent to the Redfern Allotment near the town of Mystic (J. Kanta, South Dakota Game, Fish, and Parks, Pers. Comm.). Currently, the Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These treatments are designed to enhance species diversity and

improve habitat for selected focus species. The mountain goat is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007).

Direct and Indirect Effects to Mountain Goat:

Alternative A - No Action
Direct effects may include mortality from being tangled in barbed wire fence material. Indirect effects would improve riparian habitat by elevating water tables and increase herbaceous vegetation (grasses and sedge) that would improve forage availability and quality. In the uplands (<30% slope), understory grasses and forbs would be more available for the mountain goat, and likely increase riparian shrubs, such as willow. The overall available riparian and hardwood habitat for goats would improve if livestock grazing were no longer allowed in mountain goat home ranges. Available habitat for this species would improve if competition between mountain goat and livestock is no longer allowed. However, forage competition between elk, bighorn sheep, and deer would still occur. Therefore, there may not be any appreciable increase in mountain goat numbers. Overall, habitat would likely improve in the absence of grazing compared to Alternatives B and C.

Alternative B
Direct effects may include mortality from being tangled in barbed wire fence material or if range riders causes goats to lose footing while moving to cover. Indirect effects include potential loss of foraging habitat in uplands, riparian areas, meadows, and hardwood stands due to livestock grazing and browsing (See riparian/aquatic MIS and white-tailed deer discussion). In addition, lack of diverse understory grass and shrub communities in riparian areas may increase predation and sight-ability by hunters. Periods of low forage production caused by drought would exacerbate poor forage quality and availability and increase competition with other ungulates for those resources. However, there is no indication that these resources are limiting (USDA Forest Service 2005a).

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve upland and riparian plant communities from existing conditions. Design criteria include a Drought Management approach that would allow for temporary adjustment of the annual livestock numbers and season of use during periods of drought. Although livestock grazing in riparian areas would be reduced, grazing would still affect streambank stability and extent and diversity of riparian vegetation, more than Alternative A (see riparian/aquatic MIS Alternative B).

In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C.

Movement toward meeting desired condition would improve habitat for the mountain goat but the degree of effects would depend upon the permittees' commitment to keep livestock away from riparian areas. Implementation of riparian utilization standards would improve habitat conditions for the mountain goat from existing. Alternative B should provide adequate cover and water for these species, but to a lesser degree than Alternative A.

Alternative C
Direct and indirect effects to mountain goat are similar to the effects discussed under Alternative B.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to improve if fences are constructed that limit livestock use in those areas. In general, these additional management options should improve riparian vegetation composition, increase stream bank stability, and restore hydrologic function in riparian areas more so than Alternative B. Upland utilization is expected to increase in allotment pastures that overlap mountain goat use areas where currently there is little to no use occurring, although this is not expected to have an effect on the mountain goat. Indirect effect such as a reduction in forage quantity and availability, loss of hiding cover, reduced hardwood regeneration potential would likely occur similar to Alternative B.

Movement toward meeting desired condition would improve habitat for the mountain goat but the degree of effects would depend upon the permittees' commitment to keep livestock away from riparian areas. Implementation of riparian utilization standards would improve habitat conditions for the mountain goat from existing. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate foraging and cover habitat for the mountain goat similar to Alternative B but to a lesser degree than Alternative A.

Prescribed burning in the Porcupine Allotment would have no effect on this species or its habitat.

All alternatives would be consistent with FP standards and guidelines, and Objective 221; therefore these species are likely to persist.

Cumulative Effects to Mountain Goat

Several factors can affect mountain goat populations including the harvesting of animals, climatic changes, quality of summer and winter range, parasites, and predation. Predators, such as mountain lions, have increased in recent years, which likely have resulted in direct mortality from actual predation but also mortality caused by trying to escape this predator. Juveniles are less adept at moving on steep granite terrain, and may fall to their death in the attempt to escape. However, Richardson (1971) indicates that predation at that time was insignificant. Both the legal and illegal harvesting of animals and mortality caused by vehicles also impact on the goat population.

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Higher conifer densities have resulted in the decline of understory shrub and grass species, which may have affected a change vegetation composition, growth, and vigor (SAIC 2003). Fire suppression has eliminated a primary disturbance agent, thus affecting early seral communities such as grassland and aspen. Richardson (1971) noted that goats that were trapped were in poor condition or toothless. At the time, browse in three key areas in the core goat range was moderately to severely hedged, which indicates excessive past use. Loss of new growth of desirable browse plants around the Harney Peak area was notable. Grasses and sedges in the same area were badly overgrazed by goats. It is likely that in the absence of fire, forage condition in core goat range is limiting. Competition for forage and cover resources between goats and other

ungulates, such as deer, elk, and livestock, has not been evaluated. Starvation has been indicated as a cause for mortality in the Black Hills (Tallman et al. 2002).

Due to this species preference for steep terrain, mostly located in the Black Elk Wilderness and Norbeck Wildlife Preserve, very little vegetative treatments have occurred in their core range. Within their "grass range" (Richardson 1971), activities, such as timber harvest, thinning, hardwood restoration, meadow restoration and prescribed fire, have increased forage availability for big game by reducing dense stand conditions and maintaining grassland/meadow and hardwood communities. The Hell Canyon Ranger District an approved EIS entitled the Norbeck Wildlife Project to treat overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. Proposed activities include meadow restoration, aspen regeneration/restoration, opening of forest canopies that would improve understory structure and vigor. Effects would be similar to those previously described.

Increased recreation use in the Norbeck Wildlife Preserve and Black Elk Wilderness, especially rock climbing and bouldering, could be contributing to a decline in mountain goat numbers in the Black Hills range. Mortality can occur while trying to escape human presence, especially when kids are very young and easily disturbed. Several factors associated with recreation use include displacement to less suitable habitat, noise, disruption of traditional movement corridors, loss of suitable areas for shelter/cover, loss of lichen/mosses due to excessive climbing and increased chances of dog/goat interactions (Gaines et al. 2003). Mountain goat primary ranges in 1989 appear to be shifting to areas where human contact is minimal (USDA Forest Service 1989). Due to lack of data, it is unknown whether Alternatives B and C are contributing to cumulative effects (J. Kanta, South Dakota Game, Fish, and Parks, Pers. Comm.).

Threatened, Endangered, and Region 2 sensitive Species

A biological assessment/Biological evaluation (BA/BE) would be completed for the Mystic Range Project Area for the Final EIS. The effects of the various alternatives and activities proposed would be evaluated for all Endangered Threatened, Proposed, and R2 Sensitive species, and their habitat. A BA/BE is prepared in accordance with legal requirement set forth under Section 7 of the Endangered Species Act of 1973 (19 U.S.C. 1536 (c)), and follows standards established in Forest Service Manual direction (2672.42), and the Code of Federal Regulations (50 CFR S401). The Regional Forester issued a Sensitive species list for the Rocky Mountain Region (FSM 2670), and revised Sensitive species list (FSM Regional Supplement No. 2600-2009-1, dated June 9, 2009). The BA/BE tiers directly to the Final Environmental Impact Statement for the Phase II Amendment to the Forest Plan (USDA Forest Service 2005a). The BA/BE does not address species listed as threatened or endangered by the state of South Dakota, species tracked by the South Dakota Natural Heritage Program, or USDI Fish and Wildlife Service candidate species (USDI Fish and Wildlife Service 2009c), unless they have been identified as Region 2 (R2) Sensitive species.

The USDI Fish and Wildlife Service website (http://southdakota field office.fws.gov) was consulted on January 21, 2010 (USDI Fish and Wildlife Service 2009d) to determine the current list of Threatened, Endangered, or Proposed species that occur or potentially occur in Pennington, Lawrence, and Custer Counties. The bald eagle was removed from the list of Endangered and Threatened Wildlife effective August 8, 2007, therefore this species is now considered a R2 Sensitive species. No further analysis is needed for the whooping crane, least tern, and black-

footed ferret because these species are not known or suspected to occur in the project area, and there is no suitable habitat is present (USDI Fish and Wildlife Service 2009d).

A preliminary summary of effects and determinations for Region 2 Sensitive species can be found in Appendix E of this document and are subject to change until finalized. The preliminary determinations of effects for Region 2 Sensitive species were made based on the information gathered in the pre-field review, field reconnaissance and using information provided in the MRPA draft document. The basis for the preliminary determinations is potential habitat, species distribution, and anticipated effects from proposed activities. The determination language is set forth in FSM Regional Supplement No. 2600-2009-1.

The Phase II Forest Plan Amendment FEIS (USDA Forest Service 2005a) evaluated population viability, and determined that all federally listed and R2 Sensitive species are likely to persist on the Forest over the next 50 years, if standards and guidelines are followed, and if conditions move toward Forest Plan objectives. Project implementation would incorporate all Forest Plan Standards and Guidelines. Furthermore, all alternative are consistent with Objective 221, which is to conserve or enhance habitat for R2 Sensitive species. Therefore, persistence of all federally listed and sensitive species would not be affected by any alternative of the MRP.

Norbeck Focus Species

The Norbeck Wildlife Preserve (NWP) was established by Congress for the "protection of game animals and birds and to be recognized as a breeding place therefor" under the Norbeck Organic Act (NOA). In 2001, it was ruled that the Norbeck Organic Act is the primary legislative mandate for the management of the NWP but that the Forest can continue to establish management plans under both the NOA and the National Forest Management Act (Sierra Club-Black Hills Group; American Wildlands, Inc; and Friends of the Bow v. USFS, 2001). Pursuant to public law 107-206 (2002), a Memorandum of Understanding (MOU) was signed in 2004 between the Black Hills National Forest and the South Dakota Department of Game, Fish and Parks to further cooperate and consult in the management of the NWP. However, no definition of "game animals and birds" was developed, especially in defining terminology from the NOA, such as "protection." Because of the variety of game animal and bird species that occur in the NWP, "focus species" have been identified along with terminology definitions to guide management of the Norbeck area in accordance with its original spirit and intent (Griebel et al. 2007). A portion of the Palmer Gulch Allotment in the Mystic Range Project overlaps the "Norbeck Main Portion," therefore "focus" species for this area are reviewed. Table 3-6 identifies the Norbeck focus species and how these species were evaluated for the Mystic Range Project.

Table 3-6 Focus Species, Norbeck Wildlife Preserve

Species	Project Disposition
Game Animals	
Mountain Goat (*Oreamnos americanus*)	Species of Local Concern
Bighorn Sheep (*Ovis canadensis*)	R2 Sensitive Species
Rocky Mountain Elk (*Cervus elaphus*)	See Below
White-tailed Deer (*Odocoileus virginianus)*	Management Indicator Species
Merriam's Turkey (*Meleagris gallepavo merriami*)	See Below
Birds	
Mountain Bluebird (*Sialia currucoides*)	See Below
Golden-crowned Kinglet (*Regulus satrapa*)	Species of Local Concern

Species	Project Disposition
Brown Creeper (*Certhia americana*)	Management Indicator Species
Ruffed Grouse (*Bonasa umbellus*)	Management Indicator Species
Song Sparrow (*Melospiza melodia*)	Management Indicator Species
Northern Goshawk (*Accipiter gentilis*)	R2 Sensitive Species
Black-backed Woodpecker (*Picoides arcticus*)	R2 Sensitive Species

The Hell Canyon Ranger District's Final EIS/ROD on the 'Norbeck Wildlife Project' treats overstory and understory vegetation in the Ford, Palmer, Rabbit, and Sunday Pastures of the Palmer Gulch Allotment. These treatments are to enhance species diversity and improve habitat for selected focus species. In the Mystic Range Project, there are approximately 6,185 acres of grassland communities and 3,118 acres dominated by aspen.

Rocky Mountain Elk (*Cervus elaphus*)

The Forest Plan objectives, standards, and guidelines that apply to white-tailed deer (see MIS section) also apply to elk. Objective 301 allocates 127 million pounds of forage (128,000 AUMs) to livestock use and 106 million pounds of forage to wildlife (70,000 deer and 4,500 elk) annually. Hardwood forests, meadows, and riparian areas are particularly important because these are the sites that produce the most forage (e.g., aspen and various shrubs). Forest objectives strive to increase and maintain grassland, meadow, and hardwoods forest-wide. Various structural stages of ponderosa pine provide cover and forage for this species. Forest Plan standards and guidelines specific to the NWP are 5.4A-2501 through 2503, and 5.4A-2505 would maintain or enhance habitat for this species.

Rocky Mountain elk are found in all areas of the Black Hills, mostly in higher elevations. This species was analyzed as a demand species in the Phase II Amendment EIS (USDA Forest Service 2005a) and was dropped from MIS status in the 1997 Forest Plan (SAIC 2005). Elk use a variety of vegetation types on the Forest, but show a preference for forested riparian areas, meadow edges, and aspen/birch stands. Elk find cover (thermal, escape, security) on the Forest in dense conifer stands and in hardwoods. This large game animal's diet changes from mostly grasses, forbs, and shrubs during the growing season to shrubs, hardwoods (aspen), and lichen during the winter. Competition with deer for forage is usually not an important management issue on the Forest, but when competition does occur, elk would dominate (Coe et al. 2001). In contrast, livestock grazing can have a negative impact on wintering elk through competition for forage and displacement (SAIC 2003). In general, elk avoid livestock during the summer (Coe et al. 2001). Changes in use of foraging areas have been associated with forage quality and quantity, thermal regulation in response to weather conditions, and disturbance.

Rocky Mountain elk are considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). Elk were selected as a focus species because of being a charismatic game animal, being sensitive to disturbance (e.g., roads), and that its predator was the mountain lion (Griebel et al. 2007). Population numbers have steadily increased since this species was introduced in the early 20th century and are near population objectives for the Black Hills. This species is considered a game species and is regulated by the SDGFP through annual hunting permits (South Dakota Department of Game, Fish, and Parks 2008b). The most recent Black Hills population estimate is approximately 3,500 elk (Huxoll 2008). Forest Plan Objective 217 supports habitat for management of 4,500 elk in the Black Hills, which matches South Dakota state population objectives. Elk have been documented in the all of the allotments.

Direct and Indirect Effects to Rocky Mountain Elk

Alternative A - No Action

There are no direct effects to elk expected under this alternative. However, as fences deteriorate within the NWP, injury may occur. In general, there would be no displacement of elk by livestock through competition for high quality forage, especially in hardwoods and riparian areas. Indirect effects include an increase in understory composition and structure, improved aspen/birch regeneration, and increases in the amount of available forage on both summer and winter ranges. In addition, lack of livestock grazing would likely increase composition and structure of riparian areas by raising the water table, improve water quality and shrub and understory production (forage and cover). Light to moderate livestock grazing can have a beneficial effect on forage quality by removing the rough or dried seed heads and stems, while leaving the more palatable leaves for deer or elk to graze later in the season (Anderson and Scherzinger 1975, Clark et al. 2000). Therefore, potential exists that under no grazing, forage quality and production could decline for this ungulate. The overall available habitat for elk would improve in the absence of grazing in this alternative compared to Alternative C and B.

Alternative B

There are no direct effects to elk expected under this alternative. However, existing fences within the MRP potentially could cause mortality and injury. Indirect effects include potential loss of foraging and cover habitat in uplands, riparian areas, meadows, and hardwood stands due to livestock grazing and browsing. In addition, lack of diverse understory grass and shrub communities in riparian areas potentially increase predation and sight-ability by hunters. The greatest potential for effects between elk and livestock would likely occur when competition for forage would be the greatest (late summer/fall), which could affect elk survivability during the winter. The possibility of competition for resources would be exacerbated during periods of low forage production and drought.

Generally, effects on elk are similar for white-tailed deer (See White tailed deer -Alternative B discussion). In the NWP, some riparian resource concerns have been identified due to livestock over use. For the Palmer Gulch allotment that overlaps the NWP (MA 5.4A), adjustments in season of use, number of livestock, and the number of days spent in a given pasture may be necessary to move livestock before utilization standards or threshold are exceeded. Reduction in total livestock use in this allotment may occur if grazing capacity determinations, resource conditions or both warrant these reductions. With implementing riparian stubble height requirements, riparian condition in the NWP pastures would likely improve from existing condition. This would depend on the permittees' commitment to managing distribution of livestock, especially way from riparian areas. However, in Alternative B, the lack of new structural improvements that have a potential to protect water sources and improve livestock distribution would not occur. Potentially movement toward desired conditions could take a shorter period of time as compared to Alternative C. If livestock distribution does not improve, livestock would likely move earlier than planned, ultimately leaving the NWP prior to late summer and fall. This would benefit elk if livestock grazing effects on browse species (e.g., aspen, willow) is reduced. Effects from grazing would be greater than Alternative A, but would be similar to Alternative C. Attainment of Standard 5.4A-2503 to prevent habitat degradation adjacent to water sources may be difficult without new structures to protect these areas.

Alternative C
Direct and indirect effects to elk are similar to the effects discussed under Alternative B. Generally, effects on elk are similar for white-tailed deer (See MIS white tailed deer- Alternative C discussion). Alternative C would allow for new structural improvements in the NWP, such as riparian exclosures and fences, that would help achieve better distribution of livestock and prevent habitat degradation adjacent to water sources (MA 5.4A-2503). Reduced grazing impact and increased streambank stability, improvement in riparian vegetation extent, diversity, and restoration of hydrologic function would benefit elk and other big game species. Elk would benefit if livestock grazing effects on browse species (e.g., aspen, willow) is reduced. Better distribution may reduce spatial overlap of big game and livestock during the late summer and fall (Coe et al. 2004). Although livestock grazing in riparian areas would be reduced, grazing would still affect stream bank stability, extent, and diversity of riparian vegetation, more than Alternative A.

Upland utilization is expected to increase in areas where currently there is no use occurring. This may have an effect on elk, since this species has been documented moving to the uplands to avoid livestock. In MA 5.4a, active livestock management would likely decrease foraging habitat in the NWP in on big game winter range. It is anticipated that structural improvements, if implemented, would improve livestock distribution, where it would take longer period of time before riparian thresholds are achieved. Potentially, movement toward desired conditions could take a longer period of time as compared to Alternative B due an extended grazing season. Therefore, there is a slightly greater potential to increase the effects to elk and their habitat compared to Alternative B. However, as in Alternative B, the permittees' commitment to moving livestock out of riparian areas becomes crucial to meeting desired conditions, especially later in the grazing season. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate foraging and cover habitat for elk similar to Alternative B, but to a lesser degree than Alternative A. Attainment of Standard 5.4A-2503 to prevent habitat degradation adjacent to water sources is likely under this alternative.

Prescribed burning in the Porcupine Allotment would enhance elk habitat, but this area is outside of the NWP.

Cumulative Effects to Rocky Mountain Elk

Cumulative effects to elk would be similar to deer (See MIS-white-tailed deer discussion). Vegetative treatments such as thinning, hardwood restoration, meadow restoration, and prescribed burning planned in the Norbeck Wildlife Preserve EIS would improve plant community diversity and provide additional forage for Elk in the NWP. Increase in recreational use would likely affect Elk by displacement, hunting, and predation, especially if roads used for timber harvest (Norbeck Wildlife Preserve Project FEIS) improve access to areas not previously available.

Merriam's Turkey (*Meleagris gallepavo merriami*)
Merriam's turkeys are found in all areas of the Black Hills. This species was previously considered an MIS species under the 1997 Forest Plan (SAIC 2005), but that status was removed and the turkey was analyzed as a demand species in the Phase II Amendment EIS (USDA Forest Service 2005a). The Merriam's turkey is considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). In the Black Hills, turkeys use a variety of habitats. Winter habitat consists primarily of ponderosa pine with >70% canopy cover, while open stands of

ponderosa pine with sufficient ground vegetation provide good summer habitat. Winter diets consist mainly of ponderosa pine seeds and summer diets are grass seed and foliage (Rumble and Anderson 1996). Nests usually are located near rock outcrops and shrubs located in meadows. Known predators include coyotes, magpies, and crows. Population levels have steadily increased since 1998, but fluctuate considerably due to adverse weather conditions during nesting/brood seasons. This species is considered a game species, and is regulated by the SDGFP through annual hunting permits (South Dakota Department of Game, Fish, and Parks 2008b).

Several concerns with grazing and turkey habitat management include reducing foraging habitat and nesting habitat. Loss of food sources including insects, grasses, and forbs can occur if livestock stocking rates are too high. Loss of nesting habitat can also occur as a result of livestock overuse. However, grazing can be an important management tool for improving turkey habitat. In general, a light to moderate stocking rate, with deferred or rest rotation grazing system is best for turkey habitat management. These types of grazing practices can improve nesting habitat in areas where vegetation can become too thick, increasing plant diversity and nutritional value (reduce rankness), and provide water through watering structures/developments. Direct loss of egg/nest becomes a concern when stocking density is greater than one AUM/acre (Anderson and McCuistion 2008). All of the allotments in the MRP have maximum stock rates less than one AUM/acre. Merriam's turkeys have been documented in the all of the allotments.

Direct and Indirect Effects to Merriam's Turkey

Alternative A - No Action

There are no direct effects expected under this alternative, therefore the possibility of mortality (egg loss) due to livestock grazing is eliminated. Indirect effects include improvement in riparian areas and an increase in herbaceous vegetation for nesting and concealment cover. A lack of grazing could increase invertebrates (e.g., grasshoppers) abundance in openings and meadows. However, a lack of grazing could affect nesting habitat. This alternative would provide habitat for turkey at an increased rate compared to Alternative C and Alternative B.

Alternative B

Direct effects from livestock grazing include potential mortality of eggs and nestlings due to trampling nests, crushing eggs or chicks, knocking eggs or young out of nests or beds, or covering eggs, chicks or young with manure piles. Livestock grazing may indirectly affect the Merriam's turkey by changing grassland species composition, reducing prey abundance, and reducing turkey's ability to avoid predators by removing required cover.

Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian plant communities, hydrologic function, and in-stream habitat from existing conditions. Current utilization patterns would continue or be adjusted based on annual monitoring results, and other factors (e.g., drought, fire) on a pasture by pasture basis. Some improvement in upland and riparian conditions and trends would occur with adjustments in the Annual Operating Instructions (AOI) and those management options (e.g., herding, mineral placement) available under this alternative that would improve livestock distribution away from riparian areas.

In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). Although livestock grazing in riparian areas would be reduced, grazing would still affect streambank stability, extent, and diversity of riparian vegetation more than Alternative A. In general, negative effects to those riparian areas with resource concerns are higher in Alternative B compared to Alternative C.

Movement toward meeting desired condition would improve habitat for Merriam's turkey, but the degree of effects would depend upon the permittees' commitment to improved livestock distribution, especially away from riparian areas. Implementation of riparian utilization standards would improve habitat conditions for turkeys from existing. Alternative B should provide adequate cover and water for these species similar to Alternative C, but to a lesser degree than Alternative A. Attainment of Standard 5.4A-2503 to prevent habitat degradation adjacent to water sources may be difficult without new structures to protect these areas in this alternative.

Alternative C

Direct and indirect effects to Merriam's turkey are similar to the effects discussed under Alternative B. However, mortality can also occur as a result of prescribed burning during the nesting/fledgling period (Porcupine Allotment), but this area is outside of the NWP.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures, that would help achieve better distribution of livestock across the allotment pastures. New structural improvements in the NWP, such as riparian exclosures and fences, would help achieve better distribution of livestock and prevent habitat degradation adjacent to water sources (MA 5.4A-2503). Better distribution of livestock would allow preferred grass, forb and shrub plants to recuperate and prevents their degradation from overuse. Although livestock grazing in riparian areas would be reduced, grazing would still affect streambank stability, extent, and diversity of riparian vegetation, more than Alternative A. Movement toward desired conditions in the upland and riparian areas would benefit Merriam's turkeys and their prey. In addition, reducing grazing effects on browse species (e.g., aspen, willow) would improve nesting sites.

Upland utilization is expected to increase in areas where currently there is no use occurring. This may have an effect on turkey, especially where livestock use has been historically light. As in Alternative B, movement toward meeting desired condition would improve habitat for Merriam's turkey but the degree of effects would depend upon the permittees' commitment to improved livestock distribution, especially away from riparian areas. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate foraging and cover habitat for Merriam's turkey similar to Alternative B but to a lesser degree than Alternative A.

Attainment of Standard 5.4A-2503 to prevent habitat degradation adjacent to water sources is likely under this alternative.

Prescribed burning in the Porcupine Allotment would increase foraging habitat long-term, but would reduce down woody components that provide cover from predators and nesting sites.

Cumulative Effects to Merriam's Turkey

Forest succession and fire suppression activities have resulted in a much denser forest condition in areas that have not been treated. Fire suppression has eliminated a primary disturbance agent to maintain grassland and meadows needed by this species. The lack of fire has allowed pine to encroach into former grasslands, thus reducing habitat for this species over time. Mountain pine beetle mortality would change dense forest conditions to more open pine stands with an abundant amount of down dead. These areas would provide forage and nesting habitat for turkeys. In these affected areas, pine regeneration would continue providing cover and future seed source. Past harvest activities that cause soil disturbance, usually results in pine regeneration. Vegetative treatments would likely continue and increase nesting and foraging habitat for the turkey, especially by increasing pine seed availability. However, forest succession and fire suppression would likely continue that would provide pine seed, but may also reduce other prey items. Vegetative treatments, such as thinning, hardwood restoration, meadow restoration, and prescribed burning planned in the Norbeck Wildlife Preserve FEIS, would improve plant community diversity and provide additional habitat for Merriam's turkeys in the NWP.

Development of private land, roads, conversion of native grasslands through agricultural practices, and introduction of non-native species would continue. This would reduce habitat available for turkeys and increase the hunting opportunities. Increase in recreational use would likely affect turkeys by displacement, hunting, and predation, especially if roads used for timber harvest (Norbeck Wildlife Preserve Project FEIS) improve access to areas not previously available.

Use of herbicides on both private and forest may decrease vegetation species diversity, reduce seed sources, and reduce prey availability. Pesticide use on private could reduce prey abundance that would affect turkeys in those areas.

Livestock grazing, as well as grazing by wild ungulates, would continue on Forest and on private land. For turkeys, loss of cover and nesting habitat would likely continue, along with the potential for destruction of nest and eggs through trampling, and increased predation would likely continue. Overgrazing on both forest and private land would have a negative effect on the Merriam's turkey, as well as their habitat. Alternatives B and C are expected to contribute to cumulative effects.

Mountain Bluebird (*Sialia currucoides*)

Mountain bluebirds are considered a Norbeck focus species (Griebel et al. 2007, USDA Forest Service 2004, 2007). This species is a common migrant and summer resident in the Black Hills (Tallman et al. 2002). This species prefers open areas in ponderosa pine forest and typically nests in woodlands intermixed with natural openings, such as meadows, shrub sites, and burned areas, as well as recently logged areas. These birds usually nest in old woodpecker cavities in both live and dead trees (Wiggins 2006b). The bluebird is considered a "hawking" type forager, usually hovering over the ground or flying from nearby perches. Dominate forage items include beetles, ants, caterpillars, and occasionally fruit (NatureServe 2009). There is conflicting evidence concerning the effects of livestock grazing on mountain bluebird habitat; grazing maintains short, open habitats that are preferred foraging areas, but it may also seriously reduce the recruitment of aspen and other

edge tree species (Wiggins 2006b). Forest bird monitoring indicates that population levels are stable, although regionally numbers have declined (Sauer et al. 2008). The mountain bluebird was selected to focus management activities towards meadow/grass restoration, open pine forests, and any activity (prescribed fire) that would maintain snags adjacent to foraging areas.

Direct and Indirect Effects to Mountain Bluebird

Alternative A - No Action
There are no direct or indirect effects expected under this alternative. Livestock grazing has no affect on the availability of nesting habitat for tree nesting birds. There would be no effect to this species habitat if livestock grazing was terminated. However, no grazing would likely improve foraging and watering habitat by increasing prey availability and abundance, improving riparian vegetation cover and composition, increasing water tables, and stabilizing stream morphology (See SOLC –Insectivores section).

Alternative B
There are no direct effects expected to the mountain bluebird from the grazing of livestock per se. Potential direct effects may come from possible nest disturbance and associated nesting failure (loss of eggs and hatchlings) resulting from activities related to livestock grazing, such as maintenance and reconstruction of range improvement structures (e.g. fence line clearing). Grazing could reduce plant species diversity and reduce important food sources if changes in the understory vegetation occur where specific plants to provide food and oviposition sites for prey species are removed.

In Alternative B, new structural improvements that have a potential to improve livestock distribution and reduce grazing impacts to riparian areas would not occur. Therefore meeting Forest Plan guideline 5.4A-2503 would not be achieved. Bull et al. (2001) found that stock ponds that were fenced had higher bird densities (e.g., mountain bluebird) than ponds that were not fenced. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function may continue to be of concern in the absence of management options to address those concerns (e.g. additional fencing, off-site water developments). Therefore, this alternative would negatively affect this species more so than Alternative C. Under this alternative, adherence to Forest Plan standards, guidelines and utilization standards, identifying residual levels for riparian areas, and adjustments to livestock use based on monitoring should improve riparian and upland plant communities from existing conditions. Alternative B would provide adequate forage and cover habitat for the mountain bluebird and their prey.

Alternative C
Direct and indirect effects to mountain bluebirds are similar to the effects discussed under Alternative B. Additional direct effects come from nest disturbance and possible loss of nests (eggs and hatchlings) as a result of associated activities like fence line maintenance/construction, and prescribed burning.

Livestock management options available in Alternative B would be the same in Alternative C. In addition, Alternative C would allow for new structural improvements, such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock across the allotment pastures. In riparian areas where site specific resource problems have been identified, stream morphology and hydrologic function are likely to

improve if fences are constructed that limit livestock use in those areas. In general, these additional management options should improve riparian vegetation composition, increase streambank stability, and restore hydrologic function in riparian areas more so than Alternative B. Although livestock grazing in riparian areas would be reduced, grazing would still affect streambank stability and extent and diversity of riparian vegetation, more than Alternative A.

Upland utilization is expected to increase in areas where currently there is no use occurring. This may have an effect on mountain bluebirds, especially where livestock use has been historically light, and prey species are abundant. As in Alternative B, movement toward meeting desired condition would improve habitat for mountain blue birds but the degree of effects would depend upon the permittees' commitment to improved livestock distribution, especially away from riparian areas. Adherence to Forest Plan standards, guidelines and utilization standards should provide adequate foraging and cover habitat for the mountain bluebird similar to Alternative B, but to a lesser degree than Alternative A. Attainment of Standard 5.4A-2503 to prevent habitat degradation adjacent to water sources is likely under this alternative.

Prescribed burning in the Porcupine Allotment would increase foraging habitat long-term, but could reduce nesting habitat availability depending on fire intensity and the number of snags created. However, this proposed burn area is outside of the NWP.

Cumulative Effects to Mountain Bluebird

Past activities that affect the bluebird include timber harvest (salvage and green) by the removal of large trees and snags that would have provided nesting habitat. Since this species utilizes old woodpecker cavities, cumulative effects for mountain bluebirds would be similar to woodpeckers. Management practices, including patch-cutting, overstory removal, salvage, and shelter wood harvest of ponderosa pine that reduce the number of large trees along openings and meadows, would also reduce nest site availability for the bluebird. Ponderosa pine stands have also experienced reductions in snag and down wood habitat due the firewood cutting, which was allowed Forest-wide until 1997. Vegetative treatments, such as thinning, hardwood restoration, meadow restoration, and prescribed burning planned the Norbeck Wildlife Preserve FEIS, would improve plant community diversity and provide additional habitat for mountain bluebirds in the NWP. However, removal of trees affected by mountain pine beetle, fuel breaks, and other treatment to reduce the potential for wildlife would reduce nesting habitat for this species.

Personal use firewood collection of non-standing dead would continue to occur, along with removal of standing and downed wood in designated firewood gathering areas, which may remove nest trees and foraging substrates. High road densities in some areas provide access for firewood gatherers.

Motorized travel on roads, especially near openings/meadows and grasslands, increase the chance of collision with mountain bluebirds, especially if the roads are between nesting habitat and foraging habitat. Roads used for timber harvest (Norbeck Wildlife Preserve Project FEIS) improve access to areas not previously available may increase mortality during harvest operations and increase predation. The use of pesticides on private land and herbicides on both private and Forest, can reduce prey availability.

Wildfires, such as the Jasper Fire (Porcupine Allotment) and the Horse Creek Burn (Bald Horse Allotment), and the current mountain pine beetle epidemic (USDA Forest Service 2008a), have increased nesting and foraging habitat short-term for the mountain bluebird. Future prescribed burns are expected to be beneficial for this species. However, habitat created by fires and insects would become less suitable long-term as openings become smaller and nesting/perch sites become less available.

Changes in private land from agricultural purposes to residential developments has reduced habitat for these species not only on private land. Past and future fuel reduction projects including removal of standing and downed wood within 200 feet of private land would likely reduce habitat for this species.

Migratory Birds

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines, and other factors. The BHNF recognizes the ecological and economic importance of birds, and approaches bird conservation at several levels by implementing: 1) Forest Plan objectives, standards and guidelines, 2) a Forest-wide bird monitoring program, and 3) site-specific mitigation and effects analyses for identified species of concern.

Bird monitoring is conducted at the Forest-level to determine species distribution, abundance, and trend (Rocky Mountain Bird Observatory 2001-2009). The monitoring is designed and conducted by the Rocky Mountain Bird Observatory to provide statistically rigorous population trend data for at least 61 species that breed in the Black Hills. Trend data would assist the Forest in determining whether additional conservation measures are necessary.

Migratory birds of concern are identified by many sources, including the Endangered Species Act, the Regional Forester's Sensitive species list, the BHNF MIS and SOLC lists, the USFWS list of Birds of Conservation Concern (BCC; USDI Fish and Wildlife Service 2008), and the South Dakota All Bird Conservation Plan (South Dakota Department of Game, Fish, and Parks 2005c). All of these sources and their respective species of concern, except for the BCC, have been examined elsewhere in this document and/or the Mystic Range Project Biological Assessment/Biological Evaluation (BA/BE) report.

The BCC 2008 publication lists 24 species in the conservation region that includes the Black Hills (BCR 17). However, not all of these species are found in the Black Hills National Forest. The South Dakota All Bird Conservation Plan developed priority bird species list within specific habitats in the state. For the Black Hills, Level I and II priority species have not been identified. Nineteen Level III species may be affected by either of the Mystic Range Project action alternatives (South Dakota Department of Game, Fish, and Parks 2005c), especially if they are riparian dependent. Most of the species do not need to be addressed here because: 1) specific species have another status designation that is already addressed in this document or the project BA/BE (e.g., MIS, SOLC, Sensitive), 2) their habitat needs are addressed by Forest MIS species, or 3) no habitat exists for them in the Mystic Range Project area. Full list and specific project disposition is in Appendix D of the Wildlife Specialist Report, found in the project file.

Climate Change

The USFS has embraced the management challenges posed by climate change. The agency's "Strategic Framework for Responding to Climate Change" (Hayward et al. 2009, USDA Forest

Service 2008b) provides broad direction to guide future management and research to address climate change in all aspects of agency work. With this Framework, the agency has attempted to integrate climate change throughout its organizational structure. As a result, significant momentum is building from the individual Ranger District level up through the Washington Office to actively manage fish and wildlife habitat in a way that is mindful of climate change. The uncertainty associated with climate change and the potential risk associated with novel and untested management practices would require altogether new levels of institutional flexibility. Although it is recognized that climate change may affect wildlife and fish species, the potential impacts to species in Mystic Range Project are speculative at best, especially at the scale of the project area.

FISHERIES

Affected Environment

A variety of native and non-native fish species are documented within the MRP analysis area. The lake chub and mountain sucker are Region 2 sensitive species that occur in the analysis area. These species are analyzed in the Biological Evaluation. The mountain sucker is also an MIS, and has been documented in streams within or adjacent to the Rimmer Allotment (Castle Creek), Redfern Allotment (Slate Creek), Bald Horse Allotment (Horse Creek) and Palmer Gulch Allotments (Spring Creek).

The only population of lake chub on the Forest occurs in Deerfield Reservoir (Isaak et al. 2003). The population trend for this species is one of decline, in contrast to habitat trend in Deerfield Reservoir, which appears to be stable (USDA Forest Service 2008a). The Deerfield Allotment occurs adjacent to and upstream of Deerfield Reservoir.

Other native fish species documented in the analysis area include the creek chub, fathead minnow, longnose dace, and white sucker. Non-native fish species documented in the analysis area include brook trout, brown trout, rainbow trout, largemouth bass, rock bass, and yellow perch.

Suitable fish habitat, in the form of perennial streams or lakes, is not present in the Porcupine Allotment. All other allotments have perennial water to support native and non-native fisheries.

Recreational fishing opportunities are provided by non-native gamefish species, primarily trout. Brook and brown trout fisheries are sustained almost entirely by natural reproduction, whereas rainbow trout are routinely stocked for high-use “put and take” fisheries. The principal stream fishing opportunities exist in Castle, Rapid, and Spring creeks.

There are no natural lakes in the Black Hills (Stewart and Thilenius 1964). Several impoundments provide recreational fishing opportunities within the analysis area. These include Deerfield Reservoir, Slate Creek Pond (Redfern Allotment), and Mitchell Lake (Palmer Gulch Allotment).

Additional information on watershed conditions and aquatic resources can be found in the Watershed, Geology, and Soils section.

Environmental Consequences

Direct and Indirect Effects

Some effects are common to all alternatives. Stream connectivity and fish passage is similar under all alternatives because any new instream structures would allow for the free movement of fish consistent with Standard 1203, and no existing instream fish barriers are proposed for removal. None of the alternatives would have any direct or indirect effects on fisheries in the Porcupine Allotment because no suitable fish habitat exists in that allotment.

Under Alternative A, no direct effects to fish would occur because livestock grazing would cease. Alternatives B and C are expected to have a similar direct effect (mortality/injury) to fish. This impact relates primarily to fish eggs and fry that may be trampled by livestock while watering or crossing streams. Impacts to trout are expected to be discountable due to the minimal or nonexistent overlap between their spawning season (October 15 – April 1) and livestock grazing. Livestock grazing may directly impact native fish spawning and egg incubation because they overlap in time, but the magnitude of this effect is likely to be minor because livestock are not constantly watering in all suitable spawning habitat.

Changes to aquatic and riparian habitat constitute the indirect effects to fisheries. These effects are disclosed in the hydrology section of this document. In summary, Alternative A would have the greatest positive indirect effect on fisheries because aquatic and riparian habitat conditions would improve the quickest and be maintained with the greatest certainty. These improved conditions would enhance rearing, foraging, and spawning habitat for Black Hills fish species that require cool, clear water and clean, gravel stream substrate. Implementation of the proposed action (Alternative C) is predicted to have a positive indirect effect on fish compared to Alternative B by improving those aquatic and riparian conditions that are not currently at the desired condition, but these positive benefits would be to a lesser degree than Alternative A (no grazing).

Cumulative Effects

The cumulative effects area is bounded in space as the allotments and in time as approximately the next 10-15 years into the future.

The greatest positive incremental impact to fisheries due to improved aquatic and riparian habitat conditions occurs under Alternative A, followed by Alternative C. These improved conditions are likely to maintain recreational fishing opportunities consistent with Executive Order 12962. Additional cumulative effects discussion to aquatic and riparian habitat conditions can be found in the Watershed, Geology, and Soils section.

None of the alternatives have an additive incremental impact on stream connectivity and fish movements because any existing instream barriers are unaffected.

Management Indicator Species – Fish

Mountain Sucker

Effects to the mountain sucker are disclosed in the hydrology and fisheries environmental consequences discussion and the Biological Evaluation (BE).

Long-term viability for this species was evaluated in the BE for the Forest Plan Phase II Amendment (USDA Forest Service 2005c). The Phase II BE determined that the mountain sucker was likely to persist for the next 50 years, if land management activities are implemented consistent with the Forest Plan.

The Forest-wide population trend for mountain sucker is one of decline when comparing past to present abundance and distribution (USDA Forest Service 2008a). All alternatives would have a neutral effect on the Forest-wide population trend for the mountain sucker because of this species' limited occurrence in the analysis area. Alternatives A and C meet the intent of Objective 238d better than Alternative B, with Alternative A providing the most habitat enhancement potential.

Cumulative Effects

Under either Alternative B or C, changes in mountain sucker abundance or distribution may be difficult to detect because of the limited occurrence of this species in the analysis area. Instream barriers that may impede mountain sucker distribution would persist. The increased aquatic and riparian habitat enhancement that is more likely to occur under Alternative C would not be of a magnitude that non-native fish populations are expected to dramatically increase, so no additive impact is expected to mountain suckers from the possible negative interaction with non-native fish species.

BOTANY

Analysis Methods

Effects on botanical resources were determined after considering the results of pre-field review, field reconnaissance, and survey. Botanical surveys focused on locating target plant species. They also provide general community descriptions and species lists from which basic conclusions can be drawn about the habitat. The 2005 to 2008 survey reports often include a determination of an area's potential to support target plant species.

This analysis addresses federally designated endangered and threatened species, Region 2 sensitive plant species (R2), and plant species of local concern (SOLC) which occur or which have potential habitat in the project area. An effects analysis was completed for all Region 2 sensitive plant species and plant SOLC that could potentially be impacted by the proposed project.

Existing Condition

Mystic Range Project Plant Communities

The Mystic Range Project (MRP) area includes a variety of geological and geomorphologic features across a wide range of elevation, resulting in a diverse range of ecological groups (plant communities). Ecological groups for the Black Hills are not rigorously defined, but are used as a simple ordering of similar plant associations found in the Black Hills (Marriot et al. 1999, 2000). Within the MRP area, ecological groups may occur that make it difficult to display on a map or to estimate actual acreages of each group. The following ecological groups were identified through field reconnaissance and represent the more predominate plant communities found in the area: continuous forest and woodland communities, hardwood communities, riparian

communities, high granite outcrop sparse vegetation communities, and grassland communities (Marriot et al., 1999 and Marriot and Faber-Langendoen, 2000).

The MRP is a highly productive area from the standpoint of forage resources that are provided by various plant communities found in the area. The amount of forage production is dependent upon by a wide variety of effects that include precipitation/drought, canopy cover, noxious weed infestation, conifer encroachment, and harvest by livestock and a wide variety of wildlife species. Livestock and wildlife are attracted to areas opened up in respond to the increase in forage quality and availability. However, some communities may not provide a good source of livestock forage due to a lack of sunlight, steepness of slope, and soil conditions. Plant communities may be further described by cover types as follows:

Coniferous Forest and Woodland Communities

Dry Coniferous Forest and Woodlands and Mesic Coniferous Forest Woodlands ecological groups make up over 87% of the community types found in the MRP area. The Dry Coniferous Forest and Woodland ecological group are ponderosa pine dominated plant associations. These plant associations have formed under various soil types, climatic conditions, and natural processes. Most have been affected by human disturbances throughout the last 100 years, including aggressive fire prevention, which has changed the pre-European development ecological processes historically associated with the MRP area (Parrish et al. 1996). Mesic Coniferous Forest and Woodlands include both ponderosa pine and white spruce dominant plant associations. These plant associations are usually associated with more moist conditions that provide well-developed shrub and herbaceous layers along with snags, downed dead wood, and mycorrhizae decay processes.

Dry Coniferous Forest and Woodlands ecological group includes xeric sites with more open stand conditions, usually with less than 50% canopy cover. Understory plant associations are such as bearberry, sedge, juniper and bluestem are predominately plant species that grow well in dryer conditions. Stochastic events such as large-scale wildfire, changes in climate, and insect and disease out breaks have played an important role in the establishment and succession of these pine associations (Shinneman and Baker 1997). Historical conditions exhibited more park-like pine forest with relatively few old large trees in stands. Frequent low-intensity fires causing young-tree mortality maintained these stands (Covington et al. 1994a). Increased pine trees and density during the past century, are attributed to fire suppression, timber harvest, and other human activity, but may also be a result of longer-term trends or events independent of human activity (e.g. climate change).

Mesic Coniferous Forest and Woodlands ecological group with pine overstory has a predominately shrub understory component, where the herbaceous layer is also well developed, with canopy covers ranging from 25- 60%. Understory plant associations such as juniper, chokecherry, bur oak, and snowberry predominate plant species that grow well in less dry conditions. In more moist areas of the Black Hills, including the higher elevations where frequent low-intensity fires were not part of the ecosystem, ponderosa pine stands were historically multi-storied and denser, with standing dead and down trees (Shinneman and Baker 1997).

Less than 1% of the area is in white spruce community. Most of spruce communities are in late seral or under denser stand conditions. White spruce communities usually occur on north-facing slopes, deeply dissected drainages, and forested riparian bottoms. White spruce is considered a

climax community and since the exclusion of natural fire, this community has expanded. Spruce is a shade tolerant species therefore, with dense canopies this species would increase. Due to changes in the area's natural fire regime, white spruce is invading more xeric site conditions such as grasslands, hardwoods, and ponderosa pine communities. Due to the cool mesic conditions provided by spruce communities, these areas are considered potential habitat for several R2 and SOLC plant species.

Soil studies suggest that ponderosa pine forest has replaced grasslands prior to Euro-American settlement of the Black Hills. Both open and closed stands of pine, often with many trees well over 100 years old have been found on soils typical of grasslands. Shinneman and Baker (1997) and Mehl (1992) point out that increased pine cover has also resulted from timber harvest and management. Due to the dryer conditions found in pine dominated communities, these areas are limited in providing habitat R2 and SOLC plant species. However, some *Botrychium* spp. that are normally associated with grassland communities have been found under pine overstory.

Hardwood Communities

Less than 4% of the area is in hardwood dominated community types in the MRP area. However, conifer dominated communities often contain hardwood communities such as oak, birch, aspen and green ash in isolated pockets and as understory components. Hardwood communities provide valuable habitat for many species along with structural diversity within the larger conifer ecosystem. Hardwood communities are considered to productive and biologically diverse communities and provide habitat conditions necessary for many R2 and SOLC plant species. Hardwood stands often follow drainage bottoms. This combined with the presence of higher moisture levels and less flammable foliage relative to surrounding pine stands, can make hardwood stands a natural fuel break. It takes the infrequent combination of dry conditions and heavy cured fuels for aspen to carry much of a fire (USDA Forest Service 1996). Since livestock prefer cooler mesic areas during hot dry periods, livestock tend to utilize hardwoods, especially in riparian areas (Parsons et al. 2003, McInnis and McIver 2009). In addition, livestock prefer to browse shrub species later in the season due to increased protein content and palatability compared with the declining quality of herbaceous components available (Parsons et al. 2003, Ehrhart and Hanson 1997, Gillen et al. 1985).

Aspen dominated communities are usually found on more mesic sites and typically have understory plant associations which include spiraea, chokecherry, and beaked hazel. Aspen abundance is historically a function of fire that stimulates reproduction by root suckers. On dry sites, forest management practices that traditionally have favored pine regeneration over aspen and fire suppression have contributed to the decline of aspen from pre-settlement levels on the Forest. Fire suppression of the past century has affected aspen and other hardwood communities in several ways. In the absence of fire, regeneration of old decadent stands to young vigorous stands has not occurred, and stands have become more vulnerable to insects and disease. Aspen has also been negatively affected by grazing from livestock and wild ungulates. Grazing can reduce successful deciduous tree regeneration, having an effect on forest composition through time. Aspen shoots are palatable, and overgrazing may result in the complete lose of an aspen clone (Parrish et al. 1996). This may be more acute in riparian areas or other water sources where livestock congregate.

In the Black Hills, bur oak is at the western most extent of its range (USDA Forest Service 2005). Bur oak is found along the lower elevations of the Mystic Range Project, either as pure stands or mixed with ponderosa pine or other hardwoods. Understory plant associations include ironwood, snowberry, chokecherry and sedge. Bur oak can regenerate by seed or by root sprouting; and fire is an important factor in oak establishment. According to Shepperd and Battaglia (2002), fire exclusion, livestock grazing, invading exotic competitors, and increasing big game populations have probably influenced the distribution and abundance of bur oak in the Black Hills.

Hardwood communities in general are early successional species that are susceptible to encroachment from white spruce and ponderosa pine. In the absence of disturbance to retard succession, late seral stage conifers have encroached into hardwood stands, eventually reducing or replacing them. Due to a lack of disturbance processes, the abundance, distribution, and vigor of hardwood communities has declined across the Black Hills.

Hardwood presence indicates higher moisture due to slope, aspect, or to the changes in geologic conditions. Past and current vegetative treatments (e.g., timber harvest, prescribed burning) of hardwoods in the MRP area strive to maintain this component. However, not all conifers are removed (e.g. non-commercial and seedlings) from hardwoods, allowing remaining conifers to eventually out re-compete with hardwoods in most treated areas.

Riparian Communities

Riparian ecosystems are transition zones between aquatic and upland terrestrial ecosystems, characterized by soil characteristic or distinctive plant communities that require free or unbound water (USDA Forest Service Manual 2526.05). Wetlands are areas inundated by surface or ground water to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction (USDA Forest Service Manual 2527.05). “Riparian” and “wetland” are not synonymous but overlaps do exist (Marriott et al. 1999, 2000).

Riparian and wetland areas occur in both montane and low elevation areas. Less than one percent of the MRP is within riparian communities. Riparian communities may be associated with most plant communities except the high granite outcrop sparse vegetation community. Riparian areas throughout the project area tend to support willows (*Salix* spp.), aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), Black Hills spruce (*Picea glauca*), and sedges (*Carex* spp.). Riparian associated species can be found along perennial, intermittent and ephemeral stream/drainages. In addition, numerous springs and seeps may support riparian plant communities. These habitats are some of the most productive and biologically diverse communities and provide habitat conditions necessary for many R2 and SOLC plant species.

Riparian areas provide water and cooler ambient temperatures. These areas attract and congregate livestock and other wildlife that may alter the composition of the riparian community. Indirect impacts may include changes in water quantity or flow regimes, such as the loss of beaver from the system or water diversions; changes in water quality, such as increase or decrease in sediment loading and the spread of noxious weeds (USDA Forest Service 2005).

The reduction in beaver populations and changes in groundwater and hydrologic processes (i.e. water diversion, impoundments, re-channeling streams, livestock grazing, roads and mining)

have caused significant loss of riparian habitat in the Black Hills (Parrish et al. 1996). Combined with heavy human use of riparian systems in the Black Hills, few riparian areas remain relatively undisturbed (Marriott et al. 1999, 2000).

Proper functioning riparian and wetland areas can control runoff, improve water quality, and recharge ground water (USDI Bureau of Land Management 1993). These areas serve as buffers against destructive high flow events by slowing water movement and trapping sediment, thereby protecting larger streams from flooding and sedimentation. Riparian vegetation provides stream shading, bank stability, fish cover, and woody debris for aquatic ecosystems. Species such as sage willow and autumn willow depend on water and riparian areas for most of their habitat needs.

Activities that affect ground cover, soil structure, water budgets, drainage patterns, and long-term plant species composition have the potential to impair the many values provided by riparian areas. Refer to the Forest Plan for extensive direction for riparian communities (Forest Plan Objectives 213-215). Activities such as road construction, water impoundment, ORV use, and livestock grazing can have negative effects on riparian or wetland habitat. Large scale wildfire events and presence of invasive species may also have negative impacts on these areas.

Unique riparian communities within the project area are fens. Fens are wetlands with water-saturated substrates and an accumulation of about 30 cm or more of peat (organic soil material). Peat lands, which include fens, bogs, and muskegs, are widely distributed across boreal regions. However, fens are much less common in the lower latitudes of the continental United States, where fens occupy only a small percentage of the landscape in R2. Fens are groundwater dependent and remain saturated yearlong (Austin 2006). Fens are mineral-rich, sedge dominated peatlands with a normal pH between 4.0 and 7.5, therefore, supporting higher floristic diversity than that of other peatlands (Crum 1988). In the Rocky Mountain Region, fens are critical wetlands in danger from recreational activities, peat mining, and water development projects. Since these unique habitats accumulate organic matter at such slow rates (many are over 10,000 years old) and heavily depended upon by many unique plant and animal species, they are virtually irreplaceable and demanding of protection and preservation. The US Fish and Wildlife Service have categorized all functioning fens in Region 6 as Resource Category 1 with a mitigation goal of no loss of existing habitat value (USFWS 1999).

Livestock grazing directly impacts fen vegetation through removal and trampling, and may result in soil compaction, and altered local hydrologic conditions. Any loss of the surface vegetation (trampling/rutting) may increase the potential of aeration, which would cause changes in the decay processes that are indicative of fen ecosystems (Chadde et al. 1998, Cooper and Wolf 2006). De-watering and/or water diversion that result in a reduction in groundwater could threaten, or perhaps even preclude, the existence and/or continued viability of associated fens (USDI Fish and Wildlife Service 1999). Loss of water tables within fen ecosystems have serious impact, when perennial saturated soils are reduced or lost resulting in changes in decay processes (USDA Forest Service 2005, Cooper and Wolf 2006).

In the Black Hills, fens provide habitat for Region 2 Sensitive Plant Species and Species of Local Concern including but not limited to foxtail sedge (*Carex alopecoidea*), arrowleaf sweet coltsfoot (*Petasites sagittatus*), hoary willow (*Salix candida*), and autumn willow (*Salix serissima*) (USFWS 1999).The McIntosh Fen is the most notable fen in the MRP area and is

managed as a Botanical Area (MA 3.1). In addition to the McIntosh Fen, there are approximately 4 other known fens in the MRP. Individual sites are discussed in more detail with their associated allotments.

High Granite Outcrop Sparse Vegetation Communities

This community type occurs in the Central Core zone on outcrops of Precambrian granite, schist, slate and other metamorphic rocks and includes both Harney Peak and Mt. Rushmore areas. Outcrop slope and size vary with vertical relief can be as much as 100m. There is very little soil development causing vegetation to be sparse, developing in cracks and other pockets of soil. Common species are ponderosa pine, white spruce common juniper, bearberry and brittle bladderfern. Lichens are often abundant. Natural disturbances such as fire and insect and disease infestation may have an impact on this community. However, recreation (rock climbing) and grazing by mountain goats and bighorn sheep would have the most affect on understory vegetation.

Grassland Communities

Grassland and shrubland ecosystems are defined as upland plant communities dominated by herbaceous and/or shrubby vegetation with less that 10% tree cover and usually are referred to as rangeland. Vegetation in these ecosystems consists primarily of low-growing plants such as grasses, grass-like plants, forbs, and shrubs. Due to the elevation range of the MRP area, grasslands in the MRP area can be distinguished into two primary groups; prairie grassland and interior grasslands. Prairie grasslands refer to those that generally occur on the outer perimeter of the Black Hills as a transition between the true prairie and forest of the foothills and mountains. Interior grasslands occur within the forested perimeter of the Black Hills and can include large areas dominated by plant species typically associated with prairie systems. Species composition of these grasslands can range from dry mixed grass prairie to mesic mix grass prairie (USDA Forest Service 2005). Seven percent of the area is in natural openings, meadows, and prairies that make up grassland communities.

Grasslands and meadows provide unique plant communities not usually found elsewhere within the Black Hills. Grasslands in the project area are considered primary range (high forage quality) for livestock and most have been exposed to grazing by livestock and big game for nearly a century. Historically, grassland communities provided natural fuel breaks, reducing the potential for large catastrophic stand replacing fire. Vegetative treatment, livestock grazing and prescribed fire has been used to maintain and enhance grassland communities in the Black Hills. However, the optimal frequency and intensity of some of these activities such as grazing or burning in various habitats for maintaining diversity and habitat productivity are often debated. It is now understood that varying the frequency, intensity, and timing of burning, grazing, or combinations of fire and herbivory can often increase habitat productivity and species diversity by periodically removing above-ground biomass (i.e., reducing competitive exclusion) (Guo 2007). Prescribed burning that produces high intensity/high severity conditions that affect the rooting zone of many plant species would increase the likelihood of non-native invasive species and grassland increasers to replace the native communities of montane grasslands. Prescribed burning within grassland communities should only occur following specific management objectives.

Due to changes in fire disturbance regime, ponderosa pine and white spruce have been encroaching into grassland communities for the last 100 years, in some cases, dense conifers stands are found on soils normally associated with grasslands. The changes from grassland communities to conifer

communities reduce the productivity of these plant communities, and their ability to provide habitat for wildlife and plant species. For many grassland wildlife species, native species composition and diversity are important attributes to perpetuate.

A unique grassland community type is the montane grasslands. The Upper Gillette Canyon, Middle Gillette Canyon, West Hell Canyon, and Slate Prairie grasslands are native prairies classified as Black Hills Montane Grasslands ecological group that is recommended for conservation (Marriott et al. 1999, 2000). These grasslands are wildflower-rich and primarily found west of the Central Core on the Limestone Plateau. Found at high-elevation (5000 to 6000 ft.), they have been greatly reduced with settlement therefore receiving a status rank of globally- and state-imperiled as determined by the Natural Heritage Network and The Nature Conservancy (Marriott 2000).

Over 91% was historic montane grassland have been altered by exotics (especially timothy, smooth brome, non-native clovers and Canada thistle), heavy utilization by livestock, expanded cover of native increaser species (especially rigid goldenrod and western snowberry), cultivated fields, roads, and other developments (Marriott 2000). However, high quality montane sites do still exist where 75% to 90% of the dominant vegetation cover is comprised of native grasses and/or forbs. Generally, the species composition of these sites include the following native grasses: slender wheatgrass (*Elymus trachycaulus*), timber oatgrass (*Danthonia intermedia*), green needlegrass (*Nassella viridula*), prairie dropseed (*Sporobolus heterolepis*), Richardson's needlegrass (*Achnatherum richardsonii*), and porcupinegrass (*Hesperostipa spartea*). These sites would be absent or nearly absent of native forb increasers including stiff goldenrod (*Oligoneuron rigidum*) and western snowberry (*Symphoricarpos occidentalis*) (Marriott 2000). There is no specific direction for management of montane grasslands, however, these areas are considered special, and therefore impacts to montane grasslands in the MRP were analyzed. Marriott's document provides some suggestions on conservation practices to maintain this grassland type. Individual sites will be discussed in more detail with their associated allotments.

Allotment Descriptions

Bald Horse Allotment

Ponderosa pine dominates the majority of the allotment with large expanses of grass/forb meadows primarily in the Bald Hills area. Most drainage bottoms are characterized by hardwood stands consisting of a continuum between aspen dominated to paper birch dominated. Other woody species in the allotment include bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), and white spruce. These habitats support a diverse understory of grasses, forbs, and non-vascular species.

Riparian community types occur along streams and drainages such as Brushy Creek, Gold Standard Gulch, Horse Creek, Prairie Creek, Rapid Creek, Tamarack Gulch, Victoria Creek, and Victoria Gulch. There are also numerous intermittent streams with varying amounts of associated riparian vegetation. Prairie Creek, below the C.C.C. dam, is an example of a healthy riparian system for this area. This area is dominated by shrubs and forbs, such as willows (*Salix sp.*), paper birch, and redosier dogwood (*Cornus sericea*), that are indicative of moist to saturated soils. Problem riparian areas, such as Middle Victoria Creek and Horse Creek, lack hydrophilic vegetation and are dominated by Kentucky bluegrass.

Yellow lady's slipper (*Cypripedium parviflorum*) has been located in the eastern portion of the Lower Victoria Pasture. This area is within the limestone formation and is characterized by a distinctly different soil complex than the rest of the allotment.

Leafy spurge, yellow toadflax, spotted knapweed, Canada thistle, houndstongue, and common tansy are all known to occur within the Bald Horse allotment. Biological control and other integrated pest management (IPM) approaches have been used to treat Canada thistle and leafy spurge in areas of this allotment.

Deerfield Allotment

Ponderosa pine dominates the majority of the project area with open areas covered by forb/grass/sedge meadows. These open areas encroached upon by conifer species along the edges and are converting to snowberry dominated shrublands in areas of concentrated grazing. Most drainage bottoms and north facing slopes are characterized by white spruce, mixed aspen and paper birch, or willow/sedge communities. Riparian community types occur along perennial streams such as Castle Creek, Ditch Creek, Gold Run Creek, Heely Creek, Nichols Creek, and South Fork Castle Creek. There are also numerous intermittent streams with varying amounts of associated riparian vegetation.

Deerfield Allotment straddles the contact between the Limestone Plateau and the Crystalline Core. This change in bedrock creates a unique hydrological environment which is expressed in the presence of several wetlands including fens. The most notable area in the Deerfield Allotment is the McIntosh Fen. This botanically rich area is a sedge dominated meadow with populations of sageleaf and autumn willows, both Region 2 sensitive species. The wetland is also home to pleated gentian (*Gentiana affinis*), a Black Hills National Forest plant Species of Local Concern as well as an array of other native species.

The unique hydrology, botany, and cultural resources of the McIntosh Fen prompted the Forest Service to designate this area a Botanical Area in 1997. Historically, the fen area was drained and used as a hay meadow. After the acquisition by the Forest Service in 1985, several projects, including the installation of steel plates across the main drainage ditches, have been implemented in an attempt to restore the natural hydrologic regime. Currently, the area has a lower water table than it had historically. This has caused a shift in the plant communities represented in the area.

McIntosh Fen has Canada thistle and leafy spurge infestations and smooth brome is prevalent in areas indicating drier soils. Smooth brome is a nonnative, cool-season grass that invades both warm-season and cool-season communities decreasing native species (Stacy et al. 2005). Canada thistle is a facultative upland species (usually occurs in non-wetlands 67%-99% of the time), but occasionally found on wetlands (1%-33% of the time) according to the U.S. Fish and Wildlife Service (1988). In the McIntosh fen area, Canada thistle has been treated with bio-control agents as well as herbicide application with limited success. The fen is located within the McIntosh Pasture which has been ungrazed since 1986, but is still retained as part of the allotment.

Another notable wetland complex known as Heely Fen occurs in the Heely Pasture. This fen occurs in an area surrounded by white spruce and is dominated by beaked sedge (*Carex utriculata*). In 2007, the Forest Service transplanted sageleaf and autumn willow propagules collected from McIntosh Fen in this area. The willows were excluded from livestock access with

a fence in 2008. The fence protects the young willows from livestock browsing and protects a portion of the fen from trampling by livestock.

The stream below the fen is not as well protected. Heely Creek flows through the wetland and livestock frequent the stream channel downstream of the fen. This area was formerly a privately held hay meadow until the Forest Service acquired it in the 1980s. The vegetation along Heely Creek is co-dominated by beaked sedge and Kentucky bluegrass. According to the U. S. Fish and Wildlife Service (1988), beaked sedge is an obligate wetland species (occurs 99% of the time under natural conditions in wetlands) and Kentucky bluegrass is a facultative upland species. This indicates that the soils are saturated and may have sustained riparian vegetation at one time, but overuse by livestock and other agricultural practices (such as draining) have altered the plant community composition. In addition, there are very few willows present along the creek and the width of the riparian corridor is five feet or less in many places.

Leafy spurge, yellow toadflax, Canada thistle, houndstongue, and common tansy are known to occur within the Deerfield Allotment. Both Canada thistle and leafy spurge have been treated with biological and chemical control in parts of this allotment.

Palmer Gulch Allotment

Ponderosa pine dominates the majority of the project area with occasional grasslands, mixed hardwood stands aspen and paper birch, and willows often, but not necessarily, associated with drainage bottoms. Palmer Gulch Allotment is the only allotment known to contain the High Granite Outcrop community type. Meadows within the project area are mixed grass/forb or grass/sedge meadows with increased shrub cover, primarily western snowberry. White spruce stands occur along Bear Gulch and the upper reaches of Palmer Creek.

Riparian community types occur along streams and drainages including Battle Creek, Bear Gulch, Joe Dollar Gulch, Palmer Creek, Rabbit Gulch, and Sunday Gulch.

Leafy spurge, yellow toadflax, Canada thistle, houndstongue, and common tansy are known to occur within the Palmer Gulch Allotment. Biological and chemical control has been used to treat both Canada thistle and leafy spurge in parts of this allotment.

Porcupine Allotment

The Porcupine Allotment supports a diversity of plant community types including montane grasslands, an ecosystem endemic to the Black Hills. At one point, most of the Porcupine Allotment was covered in ponderosa pine, however the Jasper Fire in 2000 burned 90% of the allotment and converted much of the allotment to grassland.

The Porcupine Allotment contains three independent montane grasslands including the Upper Gillette Canyon, Middle Gillette Canyon, and the West Hell Canyon sites. The Upper Gillette Canyon grassland is described as graminoid dominated consisting of primarily native species with few exotic species earning the highest ranking of all the montane grasslands surveyed by Marriott (2000). The Middle Gillette is described as having a mix of native and exotic species and shows signs of heavy grazing. Finally, the West Hell Canyon grassland is described as having intense, short duration grazing (Marriott 2000).

Yellow toadflax, Canada thistle, and houndstongue are known to occur within the Porcupine Allotment with biological control being used to treat Canada thistle in some areas.

Redfern Allotment
Ponderosa pine dominates the majority of the project area. Most drainage bottoms are characterized by grass/forb or grass/sedge meadows or aspen.

Riparian community types occur along drainages and streams including California Gulch, Friday Gulch, Horton Gulch, Marshall Gulch, Skull Gulch, Slate Creek, Spruce Gulch, and West Nugget Gulch. There are also numerous intermittent streams with varying amounts of associated riparian vegetation.

Iowa moonwort (*Botrychium campestre*) is known to occur in the Redfern Allotment. This Region 2 sensitive plant is located in a dry to mesic drainage bottom dominated by aspen with a diverse herbaceous and woody understory. There are other Botrychium (*Botrychium* spp.) known to occur in close proximity with frequent disturbance from ATV's and livestock noted throughout the area.

Leafy spurge, yellow toadflax, Canada thistle, houndstongue, and common tansy are known to occur within the Redfern Allotment. Both Canada thistle and leafy spurge have been treated with biological control in parts of this allotment.

Rimmer Allotment
As with most areas of the Black Hills, ponderosa pine dominates the majority of the project area. Drainage bottoms are generally more open with a shrub/grass meadow and aspen/birch component.

Riparian community types occur along perennial streams such as Castle Creek and Bittersweet Creek. There are also numerous intermittent streams with varying amounts of associated riparian vegetation. A small portion of this allotment is comprised of the Slate Prairie Montane Grassland which will be discussed under the Slate Prairie Allotment.

Yellow toadflax, Canada thistle, houndstongue, and common tansy are known to occur within the Rimmer Allotment. Areas of this allotment have been treated with biological control for Canada thistle.

Slate Prairie Allotment
Ponderosa pine dominates the majority of the project area. Most drainage bottoms and north facing slopes are characterized by white spruce stands with little vascular understory, aspen, or grass/forb or grass/sedge meadows. Little grapefern (*Botrychium simplex*) is known to occur in the Slate Prairie Allotment. Riparian community types occur along drainages and streams such as Crooked Creek, Dougherty Gulch, Hoodoo Gulch, Slate Creek, and Whitetail Gulch. There are also numerous intermittent streams with varying amounts of associated riparian vegetation.

Slate Prairie Montane Grassland overlaps with the Rimmer and Slate Prairie Allotments. It is described as having variable conditions over a large area with cultivation commonly occurring in draws, grasslands ranging from heavily grazed to excellent condition, and displaying a mosaic of grassland types (Marriott 2000). Much of the Slate Prairie Montane Grassland is held in private land ownership.

Both the Mystic Road Fen and Daugherty Fen are known to occur within the Slate Prairie Allotment. Daugherty Fen is primarily Nebraska sedge (*Carex nebraskensis*) dominated by willow (*Salix* spp.), white spruce, and water birch (*Betula occidentalis*) with visible livestock disturbance noted throughout. Mystic Road Fen is sedge dominated with a dense moss layer below. Redosier dogwood, willow, white spruce, and water birch account for most of the overstory. Livestock disturbance is minimal and occurs primarily along the fence on the east side.

Leafy spurge, yellow toadflax, Canada thistle, houndstongue, St. Johnswort, and common tansy are known to occur within the Slate Prairie Allotment. Leafy spurge and Canada thistle have been treated with biological control in areas of the allotment.

Tigerville Allotment

Ponderosa pine dominates the majority of the project area, however most drainage bottoms are characterized by aspen or open grass/forb or grass/sedge meadows.

Riparian community types occur along drainages and streams such as Burnt Fork, Lena Gulch, Newton Fork, Marshall Gulch, and Slate Creek. There are also numerous intermittent streams with varying amounts of associated riparian vegetation.

Gooseberry Fen is the only known fen located within the Tigerville Allotment. Nebraska sedge is the dominant vegetation, however, redtop (*Agrostis stolonifera*), bulrush (*Scirpus* spp.), and willow are also found. Minimal disturbance by livestock is known to occur throughout the fen.

Leafy spurge, yellow toadflax, Canada thistle, and houndstongue are known to occur within the Tigerville Allotment. Biological control has been used to treat Canada thistle and leafy spurge in areas of this allotment.

Federally Listed Plant Species

The U.S. Fish and Wildlife Service (USFWS) website list of threatened and endangered species was accessed on May 12, 2010 for the state of South Dakota. There were no threatened or endangered plant species known to occur within the State of South Dakota (USDI Fish & Wildlife Service 2010a & 2010b).

Threatened, endangered, and proposed plant species which could potentially occur on the Black Hills National Forest were identified and addressed through informal consultation with the South Dakota and Wyoming Field Offices of USFWS during the Phase II Amendment development (USDA Forest Service 2005). Subsequently, these threatened, endangered, or proposed species do not need to be further analyzed and are not mentioned in subsequent sections.

Candidate species have sufficient information on their biological status and threats to warrant a proposal to list as endangered or threatened, but development of a listing regulation is precluded by other higher priority listing activities. Species that are candidates for listing under the Endangered Species Act (ESA) are automatically placed on the Region 2 Forester's sensitive species list. The analysis and determination of effects for candidate species are included as part of the Biological Evaluation for sensitive species. The only candidate plant species known to occur on the BHNF, narrowleaf grapefern (*Botrychium lineare)*, was officially removed from the candidate list by the U.S. Fish and Wildlife Service (USDI Fish & Wildlife 2007). However, narrowleaf grapefern remains on the Region 2 sensitive plant list and is discussed under the

Biological Evaluation for Region 2 sensitive species found later in this document. No further analysis is needed for species not known or suspected to occur in the project area. Endangered Species Act Section 7 Consultation is not required for this project.

Region 2 Sensitive Plant Species

The Forest Service Manual defines sensitive species as those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidence by:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (Forest Service Manual 2670.5, 19).

The sensitive species list for the Rocky Mountain Region was published as a R2 Supplement (2600-2009-1) effective June 9, 2009. There are thirteen Region 2 sensitive plant species that are known to occur on the Black Hills National Forest; four are known to occur in the MRP area. Habitat exists in the MRP allotments for several Region 2 sensitive plant species. Table 3-7 summarizes all Region 2 sensitive plant species in the Black Hills.

Table 3-7 Region 2 sensitive plant species occurring in the Black Hills National Forest.

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
Iowa moonwort	*Botrychium campestre*	YES	YES	Inhabits grasslands from the loess prairies of Iowa and dune habitats around the Great Lakes (Lellinger 1985). Black hills occurrences are in open grassland habitats usually with high forb diversity, sometimes with a high percentage of bare and rocky soilswith limestone component. Range in elevation from 3870 to 5640ft.
Narrowleaf grapefern	*Botrychium lineare*	NO	+	In the Black Hills, may be found in open conditions on substrates with limestone components. This species has often been documented to occur in areas of road disturbances and other human and natural disturbances (Beatty et al. 2003, USDA Forest Service 2009)
Fox-tail sedge	*Carex alopecoidea*	NO	YES	In the Black Hills, foxtail sedge is currently known from two general areas: The Cement Ridge area along the South Dakota–Wyoming border, and in the Bear Lodge Mountains in Wyoming. Foxtail sedge has been found along open, perennial streams, often with old beaver dams or ponds.

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
				Occurrences are primarily documented in the transitional areas between saturated soils and the more mesic upland areas. Currently known elevation range is 3840-5900 feet. (USDA Forest Service 2009).
Yellow lady's slipper	*Cypripedium parviflorum*	YES	YES	Habitat in the Black Hills includes stream banks under both spruce and deciduous overstories, moist cliffs (usually north facing), and moist areas/seeps under spruce or mixed conifer forest. Occasionally, found higher on mesic forest slopes. Currently known to occur from 3500-6500 feet (Mergen 2003, USDA Forest Service 2005a).
Giant Helleborine	*Epipactis gigantea*	NO	NO	Warm, calcareous springs (USDA Forest Service 1996, 2002). Known only from Cascade Springs (Hornbeck et al. 2003f, USDA Forest Service 2009).
Trailing clubmoss	*Lycopodium complanatum*	NO	YES	Moist, shaded, steep, north-facing slopes in spruce/birch forest, often in moist side drainages in the Northern Black Hills and Bearlodge Mtns. (Hornbeck et al. 2002d, USDA Forest Service 2009).
Large round-leaved orchid	*Platanthera orbiculata*	NO	YES	Shady, north-facing slopes in birch/ hardwoods, occasionally conifer forests on damp, rich, humus soil. Found on Hell Canyon, Northern Hills and Bearlodge Districts (Hornbeck et al. 2003e USDA Forest Service 2009).
Bloodroot	Sanguinaria canadensis	NO	NO	Occupies floodplains, forested terraces, drainage bottoms, and north-facing foot slopes in open, rich hardwood plant communities. The currently known range in the Black Hills is limited to foothills in the northeast portion of the Black Hills, from east of Spearfish Canyon to west of Tilford. Currently known elevation range is 3940-5000 feet (Hornbeck et

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
				al. 2003b, USDA Forest Service 2005a).
Sage willow	*Salix candida*	YES	YES	One verified extant occurrence west of Deerfield (McIntosh Fen, 6,000 ft). Habitat includes cold seep or spring-fed saturated substrates produced by unusual hydrologic conditions where sedimentary layers of the Limestone Plateau intersect impermeable schist or shale of the crystalline Central Core. Community type associated with the occurrence is wet meadow fen (Glisson 2003 USDA Forest Service 2005a).
Autumn willow	*Salix serissima*	YES	YES	Fens and wet meadows. Known from McIntosh Fen (6,000 ft.), Middle Fork of Boxelder Creek (5,800 ft.), Rapid Creek (5660 ft.), and Silver Creek (5850 ft.). Appears to occur in the same unique hydrologic conditions as *Salix candida* (Hornbeck et al. 2003a, USDA Forest Service 2005a).
Sphagnum	Sphagnum angustifolim	NO	YES	Fens and wet meadows. Documented near Rochford
Highbush Cranberry	(*Viburnum opulus var. americanum*)	NO	YES	Occasional at mid-elevations in wet, shaded habitats along streams, springs and canyon bottoms. The large majority of documented occurrences occur in drainage bottoms or low slopes with dry-mesic to moist soil conditions with partial shading. Currently known occurrences are primarily associated with paper birch /ironwood (*Ostrya virginiana*) and birch/hazelnut (Corylus cornuta), with, or without spruce or aspen (*Populus tremuloides*). A few occurrences are in pine/oak (*Quercus macrocarpa*). Paper birch is present at almost all currently known sites. Currently known elevation range is 3800-5700 feet (USDA Forest Service 2009).
Selkirk's violet	*Viola selkirkii*	NO	YES	Currently known occurrences are restricted to high elevation, cold

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
				and shaded to open microhabitats associated with vegetated granitic rock outcrops or white spruce forest with a highly variable understory. All currently known Forest Service occurrences are located within Black Elk Wilderness or the Norbeck Wildlife Preserve. Currently known elevation range is 5300-7000 feet (Hornbeck et al. 2003c, USDA Forest Service 2005a).

+Based on limited knowledge of habitat requirements for this species, presence/absence of potential habitat in the project area and the habitat category for analysis were not determined.

Iowa moonwort, yellow lady slipper, sage willow, and autumn willow are the only Region 2 sensitive plant species confirmed to occur within the project area. Iowa moonwort was found in the Redfern Allotment in 2009. Yellow lady's slipper was thought to be limited to the Bald Horse Allotment, but 2010 surveys have noted numerous new locations. Sage and autumn willows occurs in the Deerfield Allotment. Species which do not occur and/or do not have potential habitat present within the MRP were not analyzed.

Analysis was conducted on the effects of the proposed action on Black Hills National Forest R2 sensitive plant species that may occur or for which potentially potential habitat occurs in the Mystic Range Project allotments. This analysis considers management activities of all action alternatives and associated mitigation measures as set forth in the MRP Environmental Impact Statement.

Species of Local Concern (SOLC)

A Species of Local Concern is described in the Forest Service Manual as plant, fish or wildlife species (including subspecies or varieties) that does not meet the criteria for sensitive status. These could include species with declining trends in only a portion of Region 2, or those that are important components of diversity in a local area. The local area is defined as NFS lands within the Black Hills National Forest (USDA Forest Service 2005). The list of SOLC appears in the Black Hills National Forest Manual (FSM 2600, Supplement r2_bh_2600-2005-1). The phase II Amendment FEIS (USDA Forest Service 2005a; Sec. 3-3.3.3 through Sec. 3-3.3.5.8) provides in-depth information (i.e., range, distribution, etc.) on Forest SOLC analyzed for the MRP. The MRP analysis for SOLC is tiered to that document, which is summarized in each species section. The most relevant Forest Plan objective for SOLC is Objective 221 which direct the Black Hills National Forest to “conserve or enhance habitat” for SOLC and to maintain long-term persistence forest-wide. There are no specific standards or guidelines to further direct attainment of the objective for the SOLC group as a whole. However, species-specific guidance would be addressed as appropriate below.

Habitat may be present in the project area for eleven plant SOLC; presently only one species is known to occur within the MRP area. The primary habitat for the SOLC plants which occur or have potential habitat within the project area can be categorized as white spruce and hardwood dominated drainage bottoms, wet meadows, and high elevation granite outcrops (Table 3-8). Potential habitat for SOLC plan species for the most part is similar for Region 2 sensitive plant species. Therefore, design criteria that are protective of Region 2 plant sensitive species are also protective of plant Species of Local Concern.

Analysis was conducted on the effects of the proposed action on Black Hills National Forest Species of Local Concern that are known to occur or for which potential habitat occurs in the MRP allotments. This analysis considers management activities of all action alternatives and associated mitigation measures as set forth in the MRP Environmental Impact Statement.

Table 3-8 Plant Species of Local Concern (SOLC) with potential habitat in Mystic Range Project Area

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
Leathery grape-fern	*Botrychium multifidum*	NO	YES	Moist meadows and rich woodlands, usually mesic sites next to riparian areas dominated by spruce or mixed spruce/pine. One occurrence in the Bearlodge Mtns. Most occurrences are all within the Norbeck Wildlife Preserve and Black Elk Wilderness from 5120-6400 feet (USDA Forest Service 2009).
Maidenhair fern	*Adiantum capillus-veneris*	NO	NO	In the Black Hills, known to occur at Cascade Springs only (Hell Canyon RD). Restricted to moist, calcareous substrates closely associated with warm or hot springs (USDA Forest Service 2009).
Southwestern showy sedge	*Carex bella*	NO	YES	Known to occur at the highest elevations in Black Hills (6,600-7,100 ft). Occurrences are in the Black Elk Wilderness, near Harney Peak, in cool and moist *Picea glauca* or *Betula papyrifera* forests with shaded conditions

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
				(USDA Forest Service 2009.
Beaked spikerush	*Eleocharis rostellata*	NO	NO	In the Black Hills, known to occur at Cascade Creek only (Hell Canyon RD) where year-round flows of warm spring water is present
Pleated gentian	*Gentiana affinis*	YES	YES	Uncommon at low to mid elevations, in moist areas with open conditions on limestone soils (5,000-6,500 ft.). Found on the Mystic and Northern Hills Districts (USDA Forest Service 2009).
Broadlipped twayblade	*Listera convallarioides*	NO	YES	known sites are located in Lawrence County on the Northern Hills RD; in boreal saturated *Picea glauca* associated habitat conditions at 5,200-6,400 ft (USDA Forest Service 2009).
Stiff clubmoss	*Lycopodium annotinum*	NO	YES	Occurrences are associated with high moisture microhabitats within remnant boreal *Picea glauca* and *Betula papyrifera* communities. Current elevation range is 5,100-6,300 feet (USDA Forest Service 2009).
Alpine mountainsorrel	*Oxyria digyna*	NO	YES	All known occurrences are in the Harney Peak Area (6,800-7,200 ft) within one square mile of each other, in areas of coarse-textured soils in steep, granite outcrop areas, and narrow gullies that have partial to full shade conditions (USDA Forest Service 2009).
Arrowleaf sweet coltsfoot	*Petasites sagittatus*	NO	YES	In the Black Hills, in open to partial shade from 5,400 to 6,750 ft and in wet to saturated soil along

COMMON NAME	SCIENTIFIC NAME	KNOWN TO OCCUR IN PROJECT AREA?	POTENTIAL HABITAT?	HABITAT CATEGORY FOR ANALYSIS
				streams and wetlands (USDA Forest Service 2009)
Northern hollyfern	*Polystichum lonchitis*	NO	YES	Known only in the NW portion of the Northern Hills and Bearlodge RD. Associated with moist, shaded, north-facing slopes in forested ravines and gulches on limestone substrates at elevations from 4,160-5,540 ft (USDA Forest Service 2009).
Shining willow	*Salix lucida* ssp. *caudata*	NO	YES	Currently known to exist only on the Bearlodge and Northern Hills District. Associated with open to partially shaded stream banks, shores, wet meadows, and seeps (USDA Forest Service 2009).

Other Areas of Concern

No Research Natural Areas (RNA) overlap with the allotments in the MRP; however the McIntosh Fen Botanical Area overlaps the Deerfield Allotment.

McIntosh Fen Botanical Area

The McIntosh Fen was first noted by A.B. Donaldson and photographed by W.H. Illingworth during the 1874 Custer Expedition. Pictures of the area in historic times provides a unique record of the area, prior to the influence of modern day man, and display the value of the area for American Indians, wildlife, fish and native plants. Later, Rydberg (1896) documented the botanical characteristics of the area. A.C. McIntosh was the first botanist to describe and investigate the unique characteristics of the area, described as a “sedge moor” (McIntosh 1930). In his survey, McIntosh reported bog buckbean and greenish sedge, which have since been extirpated. During McIntosh’s survey, the wetland was much larger; but has since been reduced with eradication of beaver and ditching to drain the meadow. This area is classified as Fen and Riparian/Wet Meadow ecological groups (Marriott et al. 1999, 2000). The sage willow stand at the McIntosh Fen received a lower quality rank, due to its small size, presence of exotics, and hydrological modifications (Marriott et al. 1999, 2000). The Baltic rush wet meadow plant association also found in the McIntosh Fen, is only found in this area in the Black Hills. This plant association is considered a “disclimax” community, since it is usually indicative of wetter phases of this community that experienced heavy grazing in the past (Marriott et al. 1999, 2000).

The Black Hills National Forest acquired the McIntosh Fen and surrounding land (approximately 320 acres) from private ownership in 1980. This is the only known calcareous fen to occur in the Black Hills (Marriott et al. 1999, 2000) but other areas such as the sphagnum bog at Black Fox is considered a "fen" by definition (Bedford and Godwin 2003). While in private ownership, the McIntosh Fen was used for agricultural use (hay meadows and grazing) which necessitated installing drainage ditches, changing stream channels, and introduction of non-native grass species to produce more livestock forage. The McIntosh Fen area includes portions of Silver and Castle Creeks. Past management resulted in changes in the water table, ultimately changing the width of the adjacent riparian areas that resulted in the loss of unique characteristics and plant species diversity associated with a larger sized fen. Lack of adequate water holding capabilities, noxious weeds, invasive species, and conifer encroachment continue to be a problem within this botanical area.

In 1980, in cooperation with the South Dakota Game Fish & Parks, the Forest Service began efforts to restore the McIntosh Fen to its historical conditions. Livestock grazing was excluded and biological control agents introduced to control the Canadian thistle. Recently, metal plates have been placed in the drainage ditches to restore the saturated water table usually associated with fen characteristics, along with willow plantings and pine encroachment. Monitoring of plant species and water levels are ongoing (USDA Forest Service 2009). Chemical spraying for noxious weeds started in 1997 on the edges of the fen to control the dense Canadian thistle population that threatens the fen. Although motorized travel in the area has been discouraged, recreational impacts (e.g., walk-in fishery status) are a potential risk for invasive species introduction.

Approximately 40% of Castle Creek riparian area above the McIntosh Fen is in private ownership. Most of this land is managed for agricultural purposes (haying and grazing). There are some new homes above the botanical area, mostly used as seasonal residences. Currently, livestock do not graze this area. Due to the limited willow stands and such tends to grazing favor sedge species over willows. Woody species are vulnerable to pruning damage, while sedges are protected by a root reserve. Livestock grazing, unless carefully controlled can cause severe damage to the herbaceous stratum due to compaction on the continually wet soils and high organic content.

The McIntosh Fen is home to the largest population of autumn willow (only three other sites known on National Forest land) and the only area where sage-leafed willow can be found in the Black Hills (USDA Forest Service 2005a). Both are R2 Sensitive species. Conservation assessments for both species have been completed (Hornbeck et al. 2003a; Glisson, 2003) that further describes these willow species, their habitat (McIntosh Fen), current management conditions, and conservation practices necessary to conserve the McIntosh Fen and these R2 Sensitive species. Monitoring of these species is completed based on the Forest Plan Monitoring Implementation Guide (USDA Forest Service 2009). Current monitoring indicates that there is a stable trend in willow species in the area (USDA Forest Service 2009).

Maintaining the water table in the McIntosh Fen is especially critical during severe drought conditions, where loss of the saturated groundwater increases the potential for wildfire to destroy the fen's peat substrate. Sources of water and recharge areas surrounding the McIntosh Fen have become the focus for conservation of this botanical area. Adjacent land uses have the potential for draw down and/or contamination of surface and groundwater that could have a long-term effect on this botanical area. Changes in hydrologic flow regimes caused by water diverting development (i.e. ponds and wells), livestock grazing of riparian areas, road construction, and development on

private land could reduce the size and uniqueness of the communities in the McIntosh Fen. These actions threaten the proper functioning of riparian systems to provide high quality and quantity of water to the botanical area. Contamination of the groundwater may occur because of County Road T303 that runs parallel to the McIntosh Fen (salting) and the improper use of pesticides and herbicides. Increased recreation use in the Deerfield area, especially motorized vehicles and ORV use provide avenues for invasive species introduction such as purple loosestrife that could be detrimental to this botanical area (Glisson 2003, Hornbeck et al. 2003a).

Noxious Weeds

Currently, 18 different species of noxious weeds (designated by the State of South Dakota) are known to occur in the MRP area. Those noxious weeds include spotted knapweed (*Centaurea maculosa*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), St. Johnswort (*Hypericum perforatum*), yellow toadflax (*Linaria vulgaris*), and Common tansy (*Tanacetum vulgare*). Several biological control agents have been used to control Canada thistle within the project area including the gall fly (*Urophora cardui*). The flea beetle (*Apthona* spp.) and leafy spurge hawk moth (*Hyles eurphorbiae*) have been released within the project area for leafy spurge control.

Noxious weeds have severely impacted western rangelands through conversion of perennial grasses to non-native dicots by overgrazing (DiTomaso 2000). Invasive and/or noxious weeds can have lasting impacts on rangelands by decreasing quality and quantity of forage for livestock and wildlife. More importantly, noxious weeds reduce plant diversity, deplete soil and water resources, and decrease wildlife habitat and forage (DiTomaso 2000).

Livestock would forage on some noxious weeds actually stabilizing or decreasing the infestation. Livestock grazing at specific times, durations, and intensity could actually decrease noxious weed infestations. Grazing weeds has the ability remove new growth which can weaken the plant, reduce flower and seed production, resulting in possible death. Livestock have been known to decrease noxious weed infestations while some studies have found that grazing may actually cause an increase in noxious weeds. Stohlgren et al. (1999) and Milchunas et al. (1992) found grazing to have little effect on and/or decrease the invasion or spread of exotic plant species versus ungrazed systems whereas, Kimball and Schiffman (2003) found livestock grazing to negatively impact native species and increase alien plant growth in California grasslands.

Environmental Effects

The analysis of direct and indirect effects for plant species focuses on R2 Sensitive species (see MRP Biological Evaluation), Species of Local Concern (SOLC), and their potential habitat as it relates to livestock grazing and range structural/non-structural improvements (e.g., fences, water developments, cattleguards, prescribed burning, and riparian improvement). The best available science for each species was taken into account, which may include additional information and referencing (e.g., conservation assessments). The cumulative effects analysis is bounded in space by a buffer of one half mile around the project area. This spatial scale is based on the assumption that a buffer of this size would encompass projects upstream and up slope that may also impact the plant species or their habitat in the MRP area. The temporal bounding of cumulative effects evaluated varies among activities, but for the purpose of this document the temporal bounding is from 1970 and up to 15-20 years future. This range accommodates the

period from the oldest allotment management planning period (1969) to a time in which actions are reasonable foreseeable. Activities evaluated are those most relevant to the area and to the species, and include livestock, grazing, fire suppression, fire occurrence, vegetative treatment (e.g., timber harvest, fuel treatments), prescribed burning, land development all of the activities occur on both public and private lands. The botany analysis is dependent on and/or complimentary to other specialist reports (e.g., hydrology, range) for the Mystic Range Project EIS. The 1997 Forest Plan FEIS (USDA Forest Service 1996) and the Phase II FEIS (USDA Forest Service 2005a) addresses cumulative effects of Forest management at the eco-regional (Black Hills) scale; please see that document for effects appropriate to that scale. In this analysis it is assumed that all reconstruction activities would occur in a 3-7 year timeframe, new structural improvements in 1-3 years and adaptive improvements in 5-10 years with continued maintenance for existing structures.

Mystic Range Project Plant Communities

In general, the impacts of grazing depend on what is being grazed. If surrounding vegetation is grazed, then competition for resources is reduced. However, individual plants affected by direct grazing or associated trampling and soil compaction. Through herbivory, trampling, and elimination of waste, large herbivores can disturb occurrences to such an extent that the plants, their pollinators, their associated mycorrhizae may not be able to survive (USDA Forest Service 2005).

Direct effects on potential habitat and undetected individuals are similar between all habitat types and include herbivory of individuals and trampling of plants and root zone by livestock (resulting in a range of impacts from additional stress to death). Limited cropping, browsing or trampling of individuals of these species by livestock would likely not have a negative impact on occurrences in the MRP, however regular and repeated cropping, browsing or trampling could have negative impacts on persistence of occurrences.

Possible indirect effects of livestock grazing to botanical resources include altered site hydrology, accelerated erosion in an occurrence, soil compaction due to trampling/hummocking, altered site composition or canopy cover (particularly of grasses and shrubs), increased competition from non-native species, altered soil microbial/mycorrhizal activity and nutrient availability, and degraded water quality in plant sites

Coniferous Forest and Woodland Communities

Effects to coniferous forest and woodland communities are minimal as grazing intensity is more likely to occur in riparian and grassland communities. However, effects may include removal of understory species resulting in decreased plant cover as sunlight is limited in these communities. Continued removal of the understory may become dominated by more shade-tolerant species as shade-intolerant species are less capable of competing following grazing.

Hardwood Communities

Livestock use in hardwood communities tends to increase late-season as livestock are in search of higher quality forage. The effects of livestock grazing to hardwood communities are similar to those mentioned below for riparian communities. However, hardwood stands may occur in drier areas, particularly, aspen communities. Furthermore, consecutive mid-season browsing of terminal leaders can lead to decreased aspen growth whereas, late-season grazing tends to decrease overall suckering growth when browsing of terminal leaders exceeds 20 percent (Jones

et al. 2009). Ultimately, continued overstory removal and repeated browsing of suckers can lead to decreased regeneration of aspens resulting in a change of plant communities.

Similar to aspen, the effects of grazing on bur oak, green ash and other hardwood communities are similar. Repeated grazing can have lasting, negative effects on regeneration if moderate to severe grazing of saplings occurs. Over time, recruitment can be negatively impacted often resulting in the establishment of less desirable species.

Prescribed fire in hardwood communities can have both negative and positive effects. Initially, burning hardwoods would cause mortality of old growth. However, fire would open the canopy while cycling nutrients. As a result, regeneration would quickly occur promoting a healthy balance between young- and old-growth maintaining a healthier community.

Riparian Communities

Discontinuing livestock grazing would decrease trampling and direct herbivory of botanical resources. With a few exceptions, these species are boreal disjunct species and occur in forested habitats that did not evolve with regular, large-animal herbivory (Froiland 1990). However, observations indicate riparian areas are frequently visited by elk and deer in the Black Hills and probably have been throughout history.

Grazing in and around wetland plant sites (including fens) may cause increased erosion, which can modify stream bank geometry and cause an increase in sedimentation and overland flow. Increases in overland flow would have the net effect of maximizing runoff and minimizing infiltration. While the increased runoff results in overall greater water yield, the storm water is delivered relatively quickly through surface processes rather than through sustained subsurface flows, which are often critical to wetland hydrology (Moore et al. 2006). Changing normal wetland hydrology (e.g. decreasing site moisture) could negatively impact plants by reducing water available for necessary biological functions. Degradation in water quality (e.g. increased nitrates) from livestock waste infiltrating surface and ground water may also affect Region 2 sensitive plant species by altering normal available nutrients. Overgrazing of stream banks is known to expose the soil fabric and loss in high flows, bank sloughing, widening of channel, and reduction in ability of plants to trap sediments (Neary and Medina 1996). Livestock waste may also locally change the natural soil balance (chemical make-up, nutrients, microbes, etc.) which can impact plants in the area. Trampling by livestock can lead to soil compaction, especially in areas with moist to saturated soils which decreases infiltration rates and increases surface runoff and erosion (Kauffman and Krueger 1984). Soil compaction can negatively impact plant occurrences by changing the regular water infiltration through the soil and decreasing oxygen available to plant roots and other essential soil organisms.

Livestock may to prefer riparian areas over upland areas from mid- to late-summer in search of water, heat relief, and more-palatable vegetation. Therefore, the effects of the current grazing regime on riparian communities, particularly all willows, are a resource concern for those pastures grazed in mid to late summer. Overgrazing can cause a decline in productivity of early- and mid-seral communities halting succession to hardwood-conifer dominated communities in riparian systems (Kauffman 1988, Kauffman et al. 1983). Removal of herbaceous material can affect vegetation structure and composition while overgrazing can result in the replacement of native bunchgrasses with Kentucky bluegrass (Kauffman and Kreuger 1984). Season-long

grazing commonly results in over-use of willows as livestock congregate in riparian areas during the hot summer months that may eventually eliminate the stand. Frequently, season-long grazing inhibits the growth of sedges resulting in an increase in Kentucky bluegrass and unpalatable forbs in willow-dominated systems (Kovalchik and Elmore 1992). Kentucky bluegrass tolerates or increases under grazing pressure, but remains unchanged in the absence of grazing (Schulz & Leininger 1990, Pond 1961). This change in ecology affects not only plant communities, but wildlife as well (Stauffer & Best 1980).

High Granite Outcrop Sparce Vegetation Communities
The effects of grazing to high granite outcrop communities are minimal. Use of these areas for grazing is limited as a result of livestock access and forage availability. However, when grazing does occur in these communities, the effects may include temporary decreased vegetation cover and increased invasive species. Since livestock rarely frequent these areas, species composition in unlikely to change from grazing alone.

Grassland Communities
The effects of large ungulate grazing on plant species composition is highly debated and varies by ecosystem type, productivity, and climatic patterns. Grazing has been found to increase plant species richness, increase spatial heterogeneity and promote biodiversity when grazing is properly managed (Bakker et al. 2003, Towne et al. 2005). Stohlgren et al. (1999) found grazing to have little influence on overall native plant richness. Grazing does influence local plant species composition, shrub cover and their frequency with great spatial variation. Few plant species display trends regarding grazing and cessation of grazing in Rocky Mountain Grasslands (Stohlgren et al. 1999).

The effects of prescribed burning to grassland communities are generally positive. Prescribed fire promotes species diversity, spatial heterogeneity, reduction of undesirable cool-season species, increased warm-season species, and management of woody species; all of which are beneficial to native grassland species, particularly *Botrychium*. *Botrychium* are commonly referred to as disturbance dependent species often associated with grasslands in the Black Hills. Litter reduction, nutrient cycling, and decreased canopy cover are all benefits of prescribed fire for *Botrychium*.

Riparian/Fen Dependent Species
Fox-tail sedge, yellow lady's slipper, trailing clubmoss, large round-leaved orchid, sage willow, and autumn willow are all R2 Sensitive Plant Species associated with riparian/fen communities. Leathery grape-fern, southwestern showy sedge, pleated gentian, broadlipped twayblade, and stiff clubmoss are all plant SOLC associated with riparian/fen communities. All of these plant species will be analyzed together in this section.

Direct and Indirect Effects on Riparian/Fen Species

Alternative A
Under Alternative A (no grazing), livestock would be allowed to graze under current management for up to two years before removing them from the eight allotments.

Discontinuing grazing would decrease the magnitude of other sources of habitat disturbance such as altered site hydrology, accelerated erosion, increased soil compaction, and degraded water quality. The quality of habitat for riparian or wetland dependent botanical resources would also

improve with the removal of livestock. The restoration of habitats impacted by livestock grazing could thereby increase the extent of potential plant habitat across the project area.

Complete removal of grazing may have negative impacts including increased litter/thatch, decreased number of microsites, decelerated nutrient cycling, and increased canopy cover. All of which could influence a single-species dominated community decreasing plant diversity and community health. Big game species would continue to have opportunities to influence vegetation and soil conditions in all plant communities.

Autumn willow and sage willow currently occur within grazing exclosures, therefore, Alternative A would have little effect on these species. In contrast, Holland et al. (2005) found that long term exclosures may increase the canopy cover of willows, actually reducing willow recruitment and decreasing species diversity within current exclosures indicating negative effects to autumn and sage willow. Indirect effects include the possible expansion of these two species populations to areas currently grazed by livestock. Also, with the removal of grazing pressure from potential habitat, these two species might also expand into other suitable habitat in the MRP.

Effects on the McIntosh Botanical Area caused by livestock use are limited because a majority of the botanical area is in the ungrazed McIntosh Pasture. If grazing were to be discontinued, it would have little impact on the values for which this botanical area was designated (Forest Plan Standard 3.1-201). Alternative A is consistent with Forest Plan Standards and Guidelines (Objective 221).

Alternative B

Direct effects of Alternative B on R2 sensitive plant species and SOLC plants known to occur within the MRP include herbivory and trampling of individuals. These effects are more likely to be experienced by the yellow lady's slipper (R2 species) and pleated gentian populations (SOLC) than the autumn or sage willow populations (R2 species) because the willow populations are protected in livestock exclosures.

If livestock distribution patterns change, known, unprotected occurrences could experience increased herbivory, trampling, and removal of aboveground plant parts potentially resulting in loss of occurrences. Potential habitat includes moist to saturated often mossy forested microsites that could be easily impacted (hummocking, trampling of vegetation) by even a small amount of livestock trampling.

When 50% upland utilization is met or four inch riparian stubble height is reached and livestock are removed from the pasture, overbrowsing of potential habitat would be minimized. Removal of up to 50% vegetation could be beneficial to some plant species as canopy cover and competition is reduced. Impacts to individuals of either autumn or sage willow would only occur if livestock managed to get past the exclosure fence, if these individuals were able to establish outside of the protected area, or livestock were used for management of weeds or botanical resources within the pasture. Livestock use within exclosure areas (such as McIntosh Fen) is not proposed by this alternative; this is further addressed within the Design Criteria (Appendix B).

Existing livestock structures would continue to be maintained as needed. Prior to relocation and reconstruction for any existing structure, the proposed site would be evaluated to protect and minimize impacts to sensitive plant occurrences and associated habitat. Alternative B is consistent with Forest Plan Standards and Guidelines (Objective 221).

Alternative C
The effects of Alternative C are similar to the effects discussed under Alternative B. However, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures to assist in management of livestock.

There would be no direct effects on known populations of yellow lady's slipper, sage willow, autumn willow, and pleated gentian from the installation of the proposed range improvements since the known populations are not co-located with the proposed installation sites. Also, annual monitoring of known populations of Region 2 sensitive and SOLC plant species are conducted as part of the Forest Plan Implementation monitoring program, so changes in quality of habitat would be noticed and trigger Adaptive Management. If needed, structures may be constructed for better management of livestock. If the location of improvements change, or new populations of Region 2 sensitive species and/or SOLC are discovered, further analysis may be needed. All new locations should be evaluated and recommended mitigation would be implemented for any new construction to protect known locations and/or suitable habitat.

Indirect effects on known populations of yellow lady's slipper and pleated gentian from the installation of the proposed range improvements may include changes in livestock behavior caused by development of new water sources and fence construction. This may cause new trails and short-term grazing areas to be formed leading to trampling and/or browsing of Region 2 sensitive species and SOLC by livestock that were previously devoid of livestock use. However, changes in livestock use as a result of the proposed improvements are likely to affect known populations.

The degree that discussed effects are realized depends on the extent and intensity of actual grazing, trampling, trailing, water structure access, and accessibility to Region 2 and SOLC plant occurrences. All known populations would be monitored and protected (adaptive management) if a decline in size of occurrences area noted.

Direct and indirect effects of proposed range improvements on undetected individuals and potential habitat depend on the type of improvement and its proposed location.

Water developments such as water tanks, stock ponds, and spring boxes may affect potential habitat and undetected individuals in riparian/fen habitat. Impacts include soil removal during installation and/or maintenance, trampling of individuals by personnel and heavy equipment during installation, obliteration of individuals located at tank sites, burial of individuals with silt removed from water developments, and inundation of individuals by dammed water. Indirect impacts include altering the hydrology of the riparian or spring area causing a shift in the local ecosystem and therefore the suitability of the habitat to accommodate botanical resources.

Impacts to undetected individuals and potential habitat associated with cattleguard installation would be minimal because most of the disturbance would occur within an existing road prism. These impacts include removal of individuals when digging the cattleguard and trampling by personnel, vehicles, and equipment.

The impacts of these range improvement projects may be counteracted by more even distribution of livestock over the grazing area, therefore minimizing specific areas from experiencing prolonged occupation by livestock.

Installation of steel plates near Palmer Creek in the Palmer Gulch Allotment would cause water within a human created channel to slow in velocity. Direct effects of plate installation may include removal or inundation of undetected individuals. These detrimental effects would be counteracted by the beneficial effect of restoring the hydrology of the area.

Effects on the McIntosh Botanical Area caused by livestock use are similar to Alternative B. There are no riparian areas in the Porcupine Allotment; therefore the proposed prescribed burn would not affect these species. The degree that the above discussed effects are realized depends on the extent and intensity of actual grazing, trampling, trailing, water structure access, and accessibility to botanical resources. Alternative B is consistent with Forest Plan Standards and Guidelines (Objective 221).

Cumulative Effects

Historic livestock overgrazing, the reduction of beaver, road construction, timber harvest activities, recreation use, mining activities, land development, and the resulting decline in hydrologic function have affected the function and potential for many riparian areas to support plant species in the MRP. Existing range improvement structures such as stock ponds, spring developments and, fences may change the distribution of livestock. If the structures concentrate livestock use, there may be loss of habitat. Drought conditions over the past decade exacerbated water availability and has contributed to the poor condition of most riparian areas.

The amount of Mountain Pine Beetle mortality that is occurring in the MRP has a greater probability to create conditions for a large stand replacing fire. This is especially true in the Palmer Gulch Allotment which is adjacent to the Black Elk Wilderness. A stand replacing wildfire such as the Jasper Fire may reduce known populations. In addition, this type of fire would likely change plant communities to early seral stages, which would result in habitat loss for most riparian dependent plant species. Increased sediment, changes in stream morphology, and hydrologic function would likely affect plant species habitat. These changes may influence distribution of riparian dependent species.

Road/trail location and recreation use (motorized vehicles) has negatively affected some riparian habitat through trampling of vegetation, increased sediment, destabilizing banks, and the spread of noxious weeds. However, the Black Hills National Forest is implementing a forest-wide travel management plan (ROD 05/07/10), which would eliminate motorized travel off-road and limit motorized use to specific areas/roads and limit use periods, reducing the impacts to these species.

Private land uses increase the potential for loss of hydrologic function for many of the allotment riparian areas. Road construction, water impoundments, wells, draining of wetlands, clearing and development would reduce habitat for riparian dependent species. Overgrazing on private land would have negative effects on these riparian dependent species, including their habitat.

Discontinuing grazing would result in locally increased litter/thatch which may facilitate the spread of wildfire in addition to increased probability of a single-species dominated community. However, current prescribed burning and timber management is expected to continue and increased risks to sensitive plants from catastrophic wildfire are not expected under the Alternative A. It is likely that cessation of grazing would be beneficial to the overall health of

riparian habitat and known occurrences of botanical resources in the MRP allotments. If this is the case, cumulative impacts as a result of Alternative A would also be beneficial.

Livestock grazing and wild ungulate grazing would continue in riparian areas which may result in direct loss due to grazing and trampling of plants. Continued grazing would add to effects from other management activities through further soil disturbance, changes in microsite moisture and hydrology regimes, and other changes in vegetation quality including increased competition from non-native species. Alternative B and C are expected to contribute to cumulative effects but not to a greater degree than currently exists.

Conclusions for Riparian/Wet Meadow Plant Species
All Alternatives will follow Forest Plan goals and objectives for botanical resources dependent on riparian/wetlands, therefore, populations and habitat would remain stable (USDA Forest Service 2005). Riparian dependent species would benefit most from Alternative A as the risk of trampling, herbivory, and altered stream hydrology from livestock are eliminated. Implementation of Alternative B and Alternative C would follow Forest Plan Standards and Guidelines and contribute to riparian stability or improvement while Alternative C allows for implementation of structures further protecting riparian dependent plant populations and their associated habitat.

High Granite Outcrop Species
Great-spurred violet (R2 Sensitive Plant Species) and alpine mountainsorrel (SOLC) are the only two plant species associated with high granite outcrop habitat. High granite outcrop is generally found in the central core on igneous or metamorphic bedrock in the highest elevations where there are higher amounts of precipitation and cooler temperatures. Vegetation is sparse with ponderosa pine, white spruce, and common juniper found in small pockets of soil or cracks. Lichens are often abundant in this community type. There are no known locations of great-spurred violet or alpine mountainsorrel in the project area.

Direct and Indirect Effects on High Granite Outcrop Species

Alternative A
Alternative A would most likely have no impact on the condition of current high granite outcrop communities by completely removing livestock grazing. These communities are rarely frequented by livestock due to accessibility and limited forage availability. By eliminating grazing, species composition is not expected to change. Therefore, Alternative A is not expected to have any impact on the habitat provided by this community or any undetected plant populations of great-spurred violet or alpine mountainsorrel occurring there.

Alternative B and Alternative C
Direct effects of Alternative B and Alternative C on botanical resources known to occur within high granite outcrops in the MRP include herbivory, trampling, and disturbance of individuals. Livestock grazing would likely have little impact on great-spurred violet and alpine mountainsorrel because a majority of their habitat is rarely frequented by livestock due to accessibility and forage availability.

Possible indirect effects of livestock grazing to botanical resources include altered site hydrology, accelerated erosion in an occurrence, soil compaction, altered site composition or canopy cover (particularly of grasses and shrubs), increased competition from non-native species, nutrient availability, and spread of noxious weed seeds to occurrence locations.

Prescribed burning in Alternative C would not occur in this habitat type. Structural improvements or maintenance are unlikely in this community. However, if it were to occur it would have little effect on this habitat due to steepness of slope and accessibility. Alternative B and Alternative C would most likely maintain the current condition and trend of all high granite outcrop habitat. Alternatives B and C are consistent with Forest Plan Standards and Guidelines (Objective 221).

Cumulative Effects
Current prescribed burning and timber management is expected to continue and increased risks to sensitive plants from catastrophic wildfire are not expected under the Alternative A. Inaccessibility and forage availability greatly reduce the use of high granite outcrops by livestock. The cessation of grazing is not likely to add to any effects of botanical resources in the MRP allotments.

Mountain Pine Beetle mortality does occur in the area increasing the opportunity for a large, stand replacing fire. A fire of this nature may cause a decrease in population. However, as a result of limited understory vegetation, it is unlikely that a shift in plant community type would occur. Increased down timber from either pine beetle mortality and/or wildfire would continue to inhibit livestock access in the area further restricting livestock use in this community type.

Alternatives B and C would likely add to effects but not more than currently exists.

Conclusions for High Granite Outcrop Plant Species
High granite outcrop dependent species habitat would benefit most from Alternative A. However, Alternative B and C are likely to have little if any impact on these communities due to limited livestock accessibility and limited forage availability.

Grassland Species
Iowa moonwort is commonly found in native prairie including midgrass to tallgrass prairie where some form of disturbance, like that of grazing has occurred (Anderson and Cariveau 2003). Narrowleaf grapefern is thought to occur in open habitats including trail edges, old roads, and abandoned fields often where slight to moderate disturbance has occurred (Beatty et al. 2003). However, specific habitat requirements for Iowa moonwort and narrowleaf grapefern are very limited. Iowa moonwort is known to occur in the Redfern Allotment in a small aspen drainage with a dense herbaceous understory that is currently grazed by livestock.

Other *Botrychium* (spp.) are commonly associated with grasslands in the Black Hills National Forest, many of which are known to occur in the MRP area. Therefore, it is important to analyze the effects of grazing on grassland habitats as suitable habitat for the narrowleaf grapefern and Iowa moonwort. Moonworts occur in areas of historical disturbance and may require a disturbance to perpetuate potential habitat, however this disturbance can occur from sources other than livestock use (such as road construction, fire, and activities associated with timber harvest) that occur relatively frequently within the project area.

Direct and Indirect Effects on Grassland Species

Direct effects on potential habitat and undetected individuals include herbivory of individuals and trampling of plants and root zone by livestock (resulting in a range of impacts from additional stress to death). Limited cropping, browsing or trampling of individuals of these species by livestock

would likely not have a negative impact on occurrences in the MRP, however regular and repeated cropping, browsing or trampling could have negative impacts on persistence of occurrences.

Indirect effects include removal of foliar cover and litter increasing germination of other plants increasing diversity. Hoof action from livestock could increase seed to soil contact while creating small microsites for seed germination possibly increasing diversity.

Discontinuing grazing can result in locally increased litter/thatch which may facilitate the spread and intensity of wildfire. However, current prescribed burning and timber management is expected to continue and increased risks to sensitive plants from catastrophic wildfire as a result of Alternative A. The cessation of grazing may not be beneficial to grassland habitat and known occurrences of botanical resources in the MRP allotments. However, controlled buns may help reduce thatch buildup.

Installation of structural improvements may also change patterns of use and behavior of livestock. This may result in the appearance of cattle trails in areas that were previously undisturbed which may benefit *Botrychium*.

Grazing grasslands may be needed to maintain current *Botrychium* populations and upward trends as they appear to rely on some form of disturbance (Beatty et al. 2003, Anderson and Cariveau 2003). *Botrychium* has the ability to remain dormant for many years withstanding drought, fire, herbivory, and other aboveground disturbances because they are highly protected belowground. Aboveground *Botrychium* populations appear highly variable as belowground structures are much more abundant than aboveground structures allowing *Botrychium* the ability to fend off local extinction (Johnson-Groh et al. 2002).

Alternative A
Under Alternative A (no grazing), livestock would be allowed to graze under current management for up to two years before removing them from the eight allotments. Discontinuing livestock grazing would decrease trampling and direct herbivory of botanical resources.

Alternative A would most likely degrade the condition of current grassland ecosystems by completely removing livestock grazing. These ecosystems evolved with some ungulate grazing and may suffer negative impacts if grazing were removed entirely. By eliminating grazing in these grasslands, change in species composition and reduced plant diversity can be expected. Complete removal of grazing from these grasslands may not increase but rather decrease *Botrychium* habitat and reduce overall floristic quality of grasslands in the project area.

Alternative B
Direct effects of Alternative B on botanical resources known to occur within the MRP include herbivory, trampling, and disturbance of individuals.

Alternative B would likely improve the condition and trend of all existing grasslands because adjustments in actual use due to projected overstocking and poor livestock distribution would occur.

Existing livestock structures would continue to be maintained as needed. Prior to reconstruction work for any existing structure, the proposed site would be evaluated to minimize impacts to sensitive plant occurrences and associated habitat.

Alternative C
Similar to Alternative B, Alternative C would likely improve the current condition and trend of grassland habitat. The effects of Alternative C are similar to the effects discussed under Alternative B. However, Alternative C would allow for new structural improvements such as fence lines, water developments, riparian exclosures, and riparian pastures that would help achieve better distribution of livestock further protecting sensitive plant populations. In addition, prescribed fire is proposed in the Porcupine allotment. This ecosystem evolved with periodic fire, so prescribed broadcast burning would most likely have a positive impact similar to that of a natural wildfire.

Direct and indirect effects of proposed range improvements on undetected individuals and potential habitat depend on the type of improvement and its proposed location. The proposed action includes establishing water tanks, stock ponds, fence, spring boxes, pipelines, trail gates, corrals, cattle guards, and steel plate dams as well as prescribed burning (only in the Porcupine Allotment). Because the locations of undetected individuals are unknown, the effects would have to be generalized for specific habitat types.

Structural improvements such as water tanks, stock ponds, pipeline installation, cattleguards, and fences would affect potential habitat and undetected individuals within the grasslands. Impacts include soil removal during installation and/or maintenance, trampling of individuals by personnel and heavy equipment, removal and burial of individuals, inundation of individuals by dammed water and overgrazing/trampling in concentrated use areas.

The impacts of these range improvement projects may be counteracted by more even distribution of livestock over the grazing area, therefore preventing specific areas, especially montane grasslands, from experiencing prolonged occupation by livestock.

Direct impacts of prescribed burning in the Porcupine Allotment would most likely affect potential habitat for moonworts. Impacts include removal of undetected individuals during control line construction, burning of individuals, introduction of toxins into the soil and water during drip-torch fuel application. In addition, prescribed burning in this habitat would decrease fuel loads from the area, decreasing the chance of catastrophic wildfire, and creating a disturbance for future moonwort populations to occupy.

The degree that the above discussed effects are realized depends on the extent and intensity of actual grazing, trampling, trailing, water structure access, and accessibility to botanical resources. As with Alternative B, range improvement project (new or reconstruction work) sites would be evaluated to minimize impacts to sensitive plant occurrences and associated plants.

Cumulative Effects
The cumulative effects of livestock grazing on botanical resources in the MRP allotments would add to effects from other management activities (e.g. timber management, recreation, etc.), through further soil disturbance, changes in microsite moisture and hydrology regimes, and other changes in plant communities.

Conclusions for Grassland Plant Species
Under all alternatives Forest Plan Standards and Guidelines would be met, therefore grassland plant species would likely remain stable (Objective 231). Grassland dependent species

(moonworts) would benefit most from Alternatives B and C. The opportunity for structural improvements to better manage livestock distribution makes Alternative C the best alternative for grasslands. Despite the risk of trampling and herbivory by livestock, properly managed grazing is beneficial to grasslands. Both Alternative B and C would maintain or improve grassland habitats, whereas, Alternative A would likely cause grassland habitat to decline by removing grazing.

Noxious Weeds

Direct and Indirect Effects on Noxious Weeds
Livestock are one of many vectors of noxious weeds by means of defecation, external transport, and creation of microsites for noxious weeds. However, livestock are a small contributor to the overall spread of noxious weeds within the MRP area. Current noxious weed infestations would likely continue. Removal of grazing would likely increase growth and vigor of noxious weeds which includes root establishment and increase seed production. However, the spread of noxious weeds associated with livestock would no longer occur.

Alternative A
The McIntosh Fen area already contains a sizable population of invasive species (Canada thistle and leafy spurge), and without livestock grazing the populations outside of the McIntosh Pasture may become more robust and produce more propagules which may expand into the Botanical Area. In its early growth stages, Canada thistle is readily consumed by livestock.

Alternative B
Continued livestock grazing would more than likely continue to create microhabitats for noxious weeds in the project area especially in concentrated use areas. Any form of disturbance in the project area has the opportunity to increase noxious weeds.

In addition, livestock would continue to be a vector for the spread of noxious weeds. However, herbivory of noxious weeds, especially early in the growing season would reduce growth and vigor of affected plants that would reduce seed production.

Possible indirect effects of livestock grazing to botanical resources include increased competition from non-native species, and spread of noxious weed seeds to occurrence locations. Some non-native and invasive species, including noxious weeds, have the ability to out-compete or shade out desired plants. Herbicides used to help control weeds can also have negative effects on Region 2 sensitive plants. Adherence to standards and guidelines present in the Forest Plan for noxious weeds would help reduce indirect and cumulative effects of weed encroachment.

Alternative C
Direct and indirect effects of grazing are the same as Alternative B. Increase in disturbance from new, reconstructed, and existing structures may provide opportunities for noxious weed establishment. Increased disturbance would likely increase noxious weed infestations. Adherence to standards and guidelines present in the Forest Plan for rehabilitation, revegetation, and control of noxious weeds would reduce direct and indirect effects of weed encroachment on botanical resources.

Cumulative Effects
Discontinuing grazing would minimize disturbance inhibiting the spread of noxious weeds throughout the project area. However, current prescribed burning and timber management is

expected to continue and increased risks to sensitive plants from noxious weeds is expected under the Alternative A. The cessation of grazing may be beneficial to decreasing the spread of noxious weeds within the MRP area. However, wildfire, timber management, and recreation are likely more of a contributing factor to cumulative impacts of noxious weeds in the project area.

The direct and indirect effects of livestock grazing on noxious weeds in the MRP allotments would add to effects from other management activities (e.g. timber management, recreation, etc.), through further soil disturbance, changes in microsite moisture and hydrology regimes, and other changes in vegetation. Timely monitoring and implementation of noxious weed treatment is essential in order to keep these negative effects to a minimum. The cumulative effects of ongoing livestock grazing would continue under the Current Grazing Practices Alternative (Alternative B), and would rely on Forest Plan Implementation monitoring of known Region 2 sensitive and SOLC plant sites to notice impacts to sites and protection to be accomplished.

The direct and indirect effects of livestock grazing on Region 2 sensitive plant species in the MRP allotments could add to effects from other management activities (e.g. timber management, recreation, etc.). Further soil disturbance, changes in microsite moisture and hydrology regimes, and other changes in vegetation quality are expected to a larger degree than Alternative A or Alternative B. Timely monitoring and implementation of appropriate adaptive management methods and noxious weed treatment when unacceptable impacts are discovered is essential, and may help offset cumulative effects from other management activities. The cumulative effects of ongoing livestock grazing would continue under Alternative C, and even with implementation of adaptive management (e.g. fencing springs and riparian areas, implementing a monitoring plan) noxious weeds are likely to continue to increase in areas.

Conclusions for Noxious Weeds

Noxious weeds are likely to increase in the project area, but monitoring would continue with the implementation of noxious weed treatment when needed. The best alternative for noxious weeds is likely Alternative A. However, even if livestock are a vector for noxious weeds they are likely small contributors to the overall spread of noxious weeds in the project area due to other forest activities (wildfire, recreation, timber management, etc.).

FIRE and FUELS

Grazing provides the opportunity for utilization of the grasses and forbs thus reducing the associated threat of wildfire occurrence. Combining the prescribed fire treatments, with grazing increases the protection of the forest system and its components from substantial loss from wildfire.

Existing fire hazard in low/moderate and high/very high conditions are identified in Table 3-9 for each allotment, except Porcupine. The table also identifies acres previously approved for prescribed burning and the resultant percent change in fire hazard post prescribed burning for each allotment.

Table 3-9 Fire Hazard Conditions

	Existing Fire Hazard Conditions		Approved Burn Acres*	Post Prescribed Burning Fire Hazard Conditions	
Allotment	Percent Low/Moderate	Percent High/Very High	Acres	Percent Low/Moderate	Percent High/Very High
Bald Horse	26	74	2,929	36	64
Deerfield	19	81	761	29	71
Palmer Gulch	8	92	6,176	60	40
Redfern	25	75	7,290	88	12
Rimmer	22	78	974	70	30
Slate Prairie	17	83	3,158	73	27
Tigerville	10	90	2,320	50	50

*ROD's from: Prairie, Mitchell, Deerfield, Slate Castle, or Upper Spring Creek Projects

The best way to reduce the risk of high severity wildfires is to reduce the accumulation of surface fuels and reduce the ladder fuels that increase the likelihood that a wildfire would transition into the tree crowns.

Utilizing prescribed fire is an effective and economic way to reduce surface fuel loadings and eliminate fine fuels that propagate the spread of a new fire start. Prescribed fire emphasis is placed on the reduction of timber litter and woody debris buildup under pine canopies by implementing prescribed burns.

Alternative A No Action

The effects of the no action alternative would result in an elevated fire hazard once livestock are removed from the allotments. Fine fuels consisting of timber litter, grasses and forbs are the primary contributors to fire initiation. These fuels respond very quickly to weather conditions and are generally the first to dry out and become available fuel for a wildfire to initiate and consume.

The desired condition of the allotment area in relation to risk is addressed by describing what proposed changes would either positively or negatively affect the sources of relative risk. The risk of lightning caused ignitions would increase due to the increased amount of fine dead fuels available where wildfires are most likely to start.

Not grazing the fuels described above would result in increased fire hazard at the margins. There are transition points throughout the forest where fuel conditions change at the micro and macro scales, and the resultant fire behavior changes accordingly. This becomes of critical importance when wildfires are very small or at the initiation stages. For example, if a new wildfire initiates and burns into a grazed area, it may very well go out due to a lack of fuel.

Contrarily, if the same wildfire burns through the same grass area that has not been grazed, then the wildfire has the opportunity to propagate and intensify due to the increased available fuel. The wildfire can burn into a transition point where ladder fuels exist giving the wildfire an opportunity to move from the surface into the crowns of the trees.

Alternatives B and C

Direct and Indirect Effects - All Allotments
Both Alternatives B and C reauthorize grazing and management functions associated with grazing would not change the wildfire hazard or risk in a positive or negative manner at the landscape scale when compared to current grazing strategies.

Both alternatives would have continued benefits as a result of the adaptive options that are generally intended to distribute grazing more evenly across the pastures. This should affect a greater area in similar fashion as described above in Alternative A where a wildfire may not be able to initiate or may run out of fuel before becoming fully established.

Grazing would have positive effects over larger areas, but may also decrease concentrated utilization in areas where a new wildfire would have opportunity to become established and burn. This micro scale effect is currently impossible to determine the net gain or loss of a changed fuels profile as it approaches the transition points that affect fire behavior.

Both Alternatives B and C would not alter conditions in a measurably different manner from existing management strategies and grazing utilization as it relates to fuel hazard.

Porcupine Allotment

Alternative C
Under Alternative C, prescribed broadcast burning is proposed for approximately 5,300 acres. At least ninety percent of the dead trees have been broken off or fallen over due to wind and rot since the Jasper Fire in 2000. This has elevated heavy dead woody debris fuel loadings to in excess of 30 tons per acre across much of the area in pockets of continuous material covered with an increasing grass component.

Prescribed burning would reduce wildfire hazard within the allotment from moderate (96 percent) to low (48 percent) by reducing hazardous fuel loadings associated with dead down woody debris. Prescribed burning would positively affect the grazing across the allotment by removing heavy dead fuel that currently serves as barriers to livestock and wildlife.
The proposed prescribed burning would alter conditions in a fashion measurably different from existing management strategies and grazing utilization as it relates to fuel hazard by removing dead fuels.

Smoke Management
The use of prescribed fire requires the evaluation of smoke emissions and impacts. Alternative 3 proposes the use of prescribed burning on 5,306 acres. Sensitive receptors such as Newcastle, WY; Custer, SD; Hill City, SD; Black Elk Wilderness and the dispersed residential areas throughout the project area will require careful smoke management planning and considerations. In addition, Wind Cave National Park is a Class 1 airshed approximately 8 miles to the south.

Forest Service policy and manual direction require prescribed fire burn plans to address 21 different elements including weather and fuel moisture conditions, as well as smoke management impacts and public notifications. These elements can be found in the Interagency Prescribed Fire Planning and Implementation Procedures Guide, which are incorporated into the Burn Plan.

Estimated prescribed fire total emissions are approximately 796 thousand pounds from 5,306 acres of prescribed fire in this alternative. Six tons per acre of fuel consumed with a 25 pound emission factor (2001 Smoke Management Guide, p. 100) to estimate on the total emissions. Estimated wildfire total emissions are calculated at approximately 1.6 million pounds using the existing condition forest. Increases in the tons per acre allow for the added consumption by a wildfire as it consumes more of the dead and downed woody debris and increased duration of smoldering associated with the drier conditions one can expect during very high or extreme wildfire conditions with 30 pounds as the emission factor (2001 Smoke Management Guide).

Accomplishing prescribe fire burning objectives is estimated to require approximately 5-10 ignition days per year spread over a period of approximately 2-5 years. This would spread the smoke emissions out in small controlled bursts over time and should reduce the localized impacts of prescribed fire implementation as well as reduce the total emissions when compared to that of a wildfire.

Cumulative Effects

Prescribed fire would have short term impacts on permittee and livestock grazing since allotment use is deferred or rested following execution of a burn (FP Guideline 4107).

Prescribed fire approved through past decisions (Slate Castle, Upper Spring Creek, Deerfield, Mitchell and Prairie Projects) are foreseeable actions that would reduce the existing fire hazard. These prescribed burns should have a positive effect at the landscape scale of breaking up the fuels continuity across the landscape both inside and outside the allotment boundary, resulting in reduced fire hazard. Wildfires that do occur should burn with less catastrophic effects than the Jasper fire in 2000, Battle Creek fire in 2002, Rico fire in 2005, or East Ridge fire in 2006.

Smoke management would be an additional cumulative effect that will have marginal impacts. Cumulative effects can be minimized through timing, and coordination with other prescribed burning to limit impacts at any specific time or location. Specific design criteria would be planned and implemented during the required planning and formal in the Burn Plan.

Summary of Effects

Large wildfires may still occur and impact the allotments. Land management activities and wildfire suppression of the past have created an existing condition with high levels of fuel accumulation that would cause wildfires to burn with higher intensities and higher resistance to control - especially during drought conditions. Prescribed burning reduces fire behavior when a wildfire runs into areas that have previously burned.

The action alternatives are expected to have positive long term effects by reducing fine fuel loading and under Alternative C with the planned prescribed burning in the Porcupine Allotment.

PHYSICAL ENVIRONMENT

WATERSHED, GEOLOGY, and SOILS

This section explains present conditions and effects to soil and water resources. The information presented here is a summary with more detail information available in the Watershed specialist report located in the project record.

This analysis was conducted on an allotment boundary basis. The allotment boundary is being used instead of watersheds, because the allotment boundaries can cross several watersheds and generally any one watershed includes only a small portion of the allotment. Watersheds are different sizes and are sized by Hydrologic Unit Codes (HUC). HUC 6 watersheds are generally 10,000 acres to 50,000 acres in size. HUC 7 watersheds are generally 5,000 to 10,000 acres in size, the next size smaller. Analysis based on the allotment boundary provides for a better understanding of effects.

A Watershed Condition Assessment was completed for each HUC 6 watershed in the process of developing the 1997 BHNF Land and Resource Management Plan (LRMP). The Watershed Condition Assessments were based on the watershed sensitivity, known impacts from all activities, and available monitoring data. Although the watershed boundaries used for Watershed Condition Assessments are slightly different than the ones used today, the information generated for the LRMP is adequate and will not be recalculated for this allotment review. Each watershed was assigned one of three Watershed Condition Classes. Watershed Condition Class I indicates that current and past management activities have not significantly affected the function of stream and riparian areas. Watershed Condition Class II indicates that moderate concerns exist and some streams and soils may be in disequilibrium. A change in the rate or nature of management activity may be necessary or stricter implementation of Watershed Conservation Practices (WCPs) may be necessary to return these watersheds to a Class I condition. Watershed Condition Class III indicates that high concerns exist and management activities must be done with great care. Additional conservation practices and watershed improvement projects may be needed (USDA Forest Service, 1996b).

Affected Environment

A watershed is defined as “The catchment area or drainage basin from which the waters of a stream or stream system are drawn” (Gove, 1996). “The term watershed describes an area of land that drains downslope to the lowest point. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves on downstream, eventually reaching an estuary and the ocean” (Watershed Definition, 2003). A watershed is made up of different components, including watershed condition, soils, springs, streams, floodplains, wetlands, water quality, and beneficial uses. These components will be discussed for each allotment.

Field Surveys

Field surveys have been completed on all eight allotments starting in 2002 and completed in 2008. Surveys across the allotments included stream classifications and locating areas of concern. In 2007, field soil surveys were conducted at 78 sites across the allotments. In 2008, 35 MIMs

(Multiple Indicator Monitoring) and PFC (Proper Functioning Condition) protocols were completed on seven of the allotments.

Bald Horse Allotment

The Bald Horse Allotment ranges in elevation from 3500 to 6100 feet with annual precipitation between 16-18 inches. Most of the precipitation comes from rain during the months of April, May, and June. Perennial streams include Rapid Creek, Prairie Creek, Victoria Creek, Horse Creek, and a small section of Spring Creek, along with various intermittent streams and ephemeral drainages. This allotment is located within parts of six Hydrologic Unit Code (HUC) 6 watersheds and within 14 HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-10. The Bald Horse Allotment is located in watersheds with Condition Classes II and III, Moderate and High Concern.

Table 3-10 Watershed Acres, Percentages Bald Horse Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201090602	Newton Fork	20,310	<1%	III
101201090603	Sheridan Lake	29,304	21%	II
101201090604	Lower Spring Creek	27,194	14%	II
101201100108	Pactola Reservoir	21,360	3%	II
101202100201	Middle Rapid Creek	30,795	53%	III
101202100202	Lower Rapid Creek	28,788	3%	II

Deerfield Allotment

The Deerfield Allotment ranges in elevation from 5900 to 7100 feet with annual precipitation between 16-24 inches. Snow accumulation and rain fall contribute to this allotment's water availability. Perennial streams include Castle Creek, Ditch Creek, South Fork Castle Creek, Heely Creek, Gold Run Creek and Nichols Creek along with various intermittent streams and ephemeral drainages. Numerous seeps/springs are located on side slopes and along drainages. This allotment is located within parts of two Hydrologic Unit Code (HUC) 6 watersheds and within six HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-11. The Deerfield Allotment is located in watersheds with Condition Class II, Moderate Concern.

Table 3-11 Watershed Acres, Percentages, Deerfield Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201100104	South Fork Castle Creek	26,680	20%	II
101201100105	Castle Creek	32,204	9%	II

Palmer Gulch Allotment

The Palmer Gulch Allotment ranges in elevation from 4600 to 7000 feet with an annual precipitation between 16-22 inches. Precipitation comes from snow in the higher elevations and rain during the months of April, May, and June. Perennial streams include Sunday Gulch, Spring Creek, Battle Creek, Bear Creek, Palmer Creek, Nelson Creek and Willow Creek along with various intermittent streams and ephemeral drainages. This allotment is located within parts of three Hydrologic Unit Code (HUC) 6 watersheds and within eight HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-12. The Palmer Gulch Allotment is located in watersheds with Condition Classes II and III, Moderate and High Concern.

Table 3-12 Watershed Acres, Percentages Palmer Gulch Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201090501	Upper Battle Creek	37,321	6%	III
101201090601	Upper Spring Creek	43,067	10%	II
101201090603	Sheridan Lake	29,304	22%	II

Porcupine Allotment

The Porcupine Allotment ranges in elevation from 5600 to 6500 feet and is located mostly on the upper limestone plateau. The annual precipitation ranges between 16-24 inches, mostly in the form of snow. Due to the limestone substrate there are no perennial streams. Riparian and wetland areas (springs/seeps) are not common compared to the other allotments. This allotment is located within parts of two Hydrologic Unit Code (HUC) 6 watersheds and within seven HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-13. The Porcupine Allotment is located in watersheds with Condition Class II, Moderate Concern.

Table 3-13 Watershed Acres, Percentages Porcupine Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201070405	Gillette Canyon	31,533	13%	II
101201070501	Upper Hell Canyon	51,070	10%	II

Redfern Allotment

The Redfern Allotment ranges in elevation from 5000 to 6200 feet with an annual precipitation ranging between 16-20 inches. The majority of the precipitation comes from rain during the months of April, May, and June. Perennial streams include Slate Creek and the headwaters of Nugget Creek along with various intermittent streams and ephemeral drainages. Springs and seeps are localized and mostly found in drainages. This allotment is located within parts of four Hydrologic Unit Code (HUC) 6 watersheds and within seven HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-14. The Redfern Allotment is located in watersheds with Condition Classes II and III, Moderate and High Concern.

Table 3-14 Watershed Acres, Percentages Redfern Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201090602	Newton Fork	20,310	4%	III
101201100106	North Fork Castle Creek	34,520	4%	II
101201100107	Slate Creek	23,471	31%	III
101201100108	Pactola Reservoir	21,360	10%	II

Rimmer Allotment

The Rimmer Allotment ranges in elevation from 5600 to 6200 feet with annual precipitation between 16-18 inches. The majority of the precipitation comes from rain during the months of April, May and June. Perennial streams include Castle Creek and the headwaters of Bittersweet Creek, along with several intermittent streams and ephemeral drainages. Springs/seeps are usually found in drainage bottoms. This allotment is located within parts of one Hydrologic Unit Code (HUC) 6 watersheds and within two HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-15. The Rimmer Allotment is located in a watershed with Condition Class II, Moderate Concern.

Table 3-15 Watershed Acres, Percentages Rimmer Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201100106	North Fork Castle Creek	34,520	6%	II

Slate Prairie

The Slate Prairie Allotment ranges in elevation from 5000 to 6200 feet. Precipitation amounts are varied usually ranging between 16-20 inches a year. The majority of the precipitation comes from rain during the months of April, May and June. Perennial streams include Slate Creek, Crooked Creek, and Dougherty Creek along with various intermittent streams and ephemeral drainages. Springs/seeps are located mostly in drainage bottoms. This allotment is located within parts of two Hydrologic Unit Code (HUC) 6 watersheds and within four HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-16. The Slate Prairie Allotment is located in watersheds with Condition Classes II and III, Moderate and High Concern.

Table 3-16 Watershed Acres, Percentages Slate Prairie Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201100106	North Fork Castle Creek	34,520	11%	II
101201100107	Slate Creek	23,471	8%	III

Tigerville Allotment

The Tigerville Allotment ranges in elevation from 5100 to 6100 feet with an annual precipitation ranging from 16-20 inches. The majority of the precipitation comes from rain during the months of April, May and June. Perennial streams include East Slate Creek, Newton Fork, and Burnt Fork along with various intermittent streams and ephemeral drainages. Springs/seeps are mostly found in drainage bottoms. This allotment is located within parts of two Hydrologic Unit Code (HUC) 6 watersheds and within five HUC 7 watersheds (Gonyer, 2009). This allotment represents a percentage of each watershed as shown in Table 3-17. The Tigerville Allotment is located in watersheds with Condition Class III, High Concern.

Table 3-17 Watershed Acres, Percentages Tigerville Allotment.

HUC 6 Watershed	Watershed Name	Watershed Acres	% of Watershed In Allotment	Watershed Condition Class
101201090602	Newton Fork	20,310	23%	III
101201100107	Slate Creek	23,471	4%	III

Soils

All of the allotments have some soil map units that are subject to compaction when wet. These soil map units primarily support Ponderosa Pine. Table xx below lists the acreage within each allotment that has been compacted or has detrimentally impacted soils due to heavy livestock use along fences, cattle trails, at salt licks, or at water developments. The percentage of each allotment that is affected is below the 15% detrimentally impacted soils standard as described by the Forest Plan (USDA Forest Service, 2007b).

A Soil Health Monitoring/Assessment Protocol was conducted at each soil survey site. Observation on all allotments indicated that the soils are in good shape and functioning properly. There were no indications of erosion, compaction, or loss of organic matter/ground cover at the sites. However, one site on the Slate Prairie Allotment showed compaction and a platy soil structure. The area was

noticeably hard when you walked on the site. The other seven allotments did not contain areas that were detrimentally impacted by livestock.

Table 3-18 below lists the number of soil map units and the percentage of the allotment that has a high erosion hazard rating within each allotment. For all of the allotments, the soil map units with high erosion hazard tend to be the steeper areas which livestock typically do not graze.

Table 3-18 Soil Map Units

	Bald Horse	Deerfield	Palmer Gulch	Porcupine	Redfern	Rimmer	Slate Prairie	Tigerville
Soil Map Units	23	20	17	11	8	7	7	8
Portion of Allotment that has a High Erosion Hazard Rating	37%	13%	32%	3%	35%	23%	19%	14%
Compacted or Detrimentally Impacted Soils (percentage of allotment impacted)	35 acres (0.13%)	9 acres (0.12%)	20 acres (0.14%)	30 acres (0.30%)	25 acres (0.21%)	3 acres 0.15%)	25 acres (0.42%)	15 acres (0.26%)
Soil Sites Surveyed	9	10	10	11	9	10	10	9

Springs and Streams

"The term watershed describes an area of land that drains downslope to the lowest point. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves on downstream, eventually reaching an estuary and the ocean" (Watershed Definition, 2005). The number of HUC 6 watersheds is displayed in the table below for each allotment. HUC 6 watersheds are 10,000 to 50,000 acres in size.

The miles of streams are also shown in the table below. Perennial streams have flowing water year-round provided by ground water. Intermittent streams have flowing water for extended periods of time when ground water provides water for stream flow. Ephemeral streams have flowing water only during and for a short duration after precipitation events. Stream bed is located above the water table year-round.

Table 3-19 Stream Miles

	Bald Horse	Deerfield	Palmer Gulch	Porcupine	Redfern	Rimmer	Slate Prairie	Tigerville
Number of Watersheds within Allotment	5	2	3	2	4	1	2	2
Miles of Stream within Allotment	92 miles	19 miles	40 miles	31 miles	48 miles	8 miles	20 miles	20 miles
Miles of Perennial	21 miles	13 miles	12 miles	0 miles	11 miles	4 miles	6 miles	4 miles
Miles of Intermittent	21 miles	1 miles	6 miles	0 miles	18 miles	1 miles	3 miles	3 miles
Miles of Ephemeral	50 miles	5 miles	22 miles	31 miles	19 miles	3 miles	11 miles	13 miles

Floodplains and Wetlands

National Wetland Inventory (NWI) delineations are done by photo-interpretation and may not be accurate representations of actual wetland conditions. Field inventories have not yet been conducted to confirm if these mapped wetlands are jurisdictional wetlands. From past observations, most mapped wetlands are generally not jurisdictional wetlands.

Table 3-20 Floodplains and Wetlands

	Bald Horse	Deerfield	Palmer Gulch	Porcupine	Redfern	Rimmer	Slate Prairie	Tigerville
Acres of Mapped 100 -yr Floodplains	364 acres	208 acres	101 acres	161 acres	213 acres	11 acres	4 acres	21 acres
Acres of Polygon Mapped Wetlands	1.9 acres	78.4 acres	22.3 acres	0.5 acres	10.8 acres	0 acres	0.9 acres	4.3 acres
Miles of Linear Mapped Wetlands	32.9 miles	10.4 miles	10.7 miles	4.7 miles	10.2 miles	2.3 miles	5.2 miles	5.6 miles

Beneficial Uses and Water Quality

All streams within South Dakota are assigned the beneficial uses of irrigation, fish and wildlife propagation, recreation, and stock watering (SD Administrative Code 74:51:03:01). Additional beneficial uses are assigned to additional streams and are displayed by allotment. Stream health ratings have been assigned to the streams in the allotments. Stream health are the conditions of a stream using metrics such as channel geometry, large woody debris, substrate, bank stability, flow regime, water chemistry, and aquatic biota. There are three stream health classes recognized in the Rocky Mountain Region: robust, at-risk and diminished. These classes are used for assessing long-term stream health and impacts from management activities.

- Robust stream health exhibits high geomorphic, hydrologic and/or biotic integrity. High integrity is indicated by conditions that are 74 – 100% of a reference condition. Physical, chemical and/or biologic conditions suggest that State assigned water quality (beneficial, designated or classified) uses are supported.
- At-risk stream health exhibits moderate geomorphic, hydrologic and/or biotic integrity. Moderate integrity is indicated by conditions that are 59 – 73 % of a reference condition. Physical, chemical and/or biologic conditions suggest that State assigned water quality (beneficial, designated or classified) uses are at risk and may be threatened.
- Diminished stream health exhibits low geomorphic, hydrologic and/or biotic integrity. Low integrity is indicated by conditions that are less than 58% of a reference condition. Physical, chemical and/or biologic conditions suggest that State assigned water quality (beneficial, designated or classified) uses may not be supported.

Below are the beneficial uses, water quality issues and stream health per allotment.

Bald Horse Allotment

South Dakota Department of Environment and Natural Resources (SD DENR) had assigned additional beneficial uses for Horse Creek, Prairie Creek, Rapid Creek, South Victoria Creek, Spring Creek and Victoria Creek. Horse Creek and South Victoria Creek have additional beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters. Prairie Creek and Victoria Creek have the additional beneficial uses of coldwater permanent fish life propagation

waters and limited-contact recreation waters. The additional beneficial uses for Rapid Creek are domestic water supply, coldwater permanent fish life propagation waters, immersion recreation waters, and limited-contact recreation waters. Spring Creek's additional beneficial uses are coldwater marginal fish life propagation waters, immersion recreation waters and limited-contact recreation waters.

Most streams and headwater areas of streams within this allotment are not listed in the SD DENR 303(d) list of impaired streams (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses. There are three streams that are listed as having impaired reaches on the 303(d) list. Rapid Creek, Spring Creek and Victoria Creek are not meeting their beneficial use of coldwater permanent fish life propagation because of high temperatures from natural sources. Natural sources refer to condition not aggravated by human activities and many times it is due to naturally occurring low summer flows. The area along Rapid Creek that is within the allotment boundary is not grazed. Spring Creek receives light grazing and Victoria Creek is in the center of the allotment.

Two MIMs and three PFC protocols were completed on several streams. The MIM on Horse Creek indicated that there were bank stability and bank alteration concerns. The Victoria Creek MIM showed there were bank alteration concerns. PFCs completed on Burnt Ranch Tributary, Prairie Creek and Victoria Creek had functional ratings of proper-functioning-condition, proper-functioning-condition and functional-at-risk with an upward-trend, respectively. Stream health classification for all the streams within the allotment were designated as at-risk.

Areas of concern on the allotment include:

- On Horse Creek, where a MIM was completed, bank alteration and stream bank stability. Trampling on Horse Creek is a concern. A MIM was completed on Victoria Creek also where bank alteration is a concern.
- PFC rating of functional-at-risk on Victoria Creek is a concern.
- Trampling of the stream and wet areas have been observed and are a concern on; Bald Hills Spring 2, Brush Creek, Burnt Ranch Draw, Prairie Creek, South Victoria Creek, and Tamarack Gulch. Trampling and hummocking was observed and is a concern on a tributary to Victoria Creek.

Deerfield Allotment

SD DENR had assigned additional beneficial uses for Castle Creek, Ditch Creek, Gold Run Creek, Heeley Creek, Nichols Creek and Silver Creek. All of these streams, except Nichols Creek, have additional designated beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters. Nichols Creek has additional beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters.

No streams and headwater areas of streams within this allotment are listed in the SD DENR 303(d) list (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses.

One MIM and two PFC protocols were completed on several streams. The MIM on Heeley Creek indicated that there were bank stability and bank alteration concerns. PFCs completed on South Fork

Castle Creek Section 11 and South Fork Castle Creek Section 36 had functional ratings of functional-at-risk with an upward-trend and proper-functioning-condition, respectively. Stream health classification for all the streams within the allotment were designated as at-risk, except Castle Creek was designated robust and Silver Creek is diminished.

Areas of concern on the allotment include:

- On Heeley Creek, where a MIM was completed, bank alteration and stream bank stability is a concern. Trampling of the stream is also a concern.
- PFC rating of functional-at-risk on South Fork Castle Creek is a concern.

Palmer Gulch Allotment

SD DENR had assigned additional beneficial uses for Battle Creek, Bear Gulch Creek, Palmer Gulch Creek, Spring Creek, Sunday Gulch Creek and Tenderfoot Creek. All of these streams, except Bear Gulch Creek and Spring Creek, have additional designated beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters. Bear Gulch Creek has additional beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters and Spring Creek has additional beneficial uses of coldwater permanent fish life propagation waters, immersion recreation waters and limited-contact recreation waters.

Most streams and headwater areas of streams within this allotment are not listed in the SD DENR 303(d) list of impaired streams (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses. Spring Creek is listed as an impaired reach. Spring Creek is not meeting the beneficial use of Coldwater Permanent Fish Life waters because of high temperatures from natural sources. Natural sources refer to condition not aggravated by human activities and many times is due to low summer flows. Spring Creek is not meeting the beneficial use of Immersion Recreation water because of fecal coliform from livestock, human and wildlife as identified in the Total Ma. The allotment encompasses approximately 2 miles of the 35 mile long Spring Creek and receives minimal grazing.

One MIM and three PFC protocols were completed on several streams. The MIM on Bear Gulch Creek indicated that there were bank alteration concerns. PFCs completed on Palmer Creek and Rabbit Gulch had functional ratings of functional-at-risk with no apparent trend; and Samalias Creek had a functional rating of proper-functioning-condition. Stream health classification for all the streams within the allotment were designated as at-risk, except Spring Creek which was rated as diminished because of past channel alteration from the railroad and highway.

Areas of concern on the allotment include:

- On Bear Gulch Creek, where a MIM was completed, bank alteration is a concern. Trampling of the stream is also a concern.
- PFC rating of functional-at-risk on Palmer Creek and Rabbit Gulch is a concern. Trampling is occurring on Rabbit Gulch.

Porcupine Allotment

All streams within the Porcupine Allotment are ephemeral. Since there is a lack of water in this allotment, there are no additional assigned beneficial uses for any of the streams and no streams are listed as impaired.

No MIM or PFC protocols were completed on the Porcupine Allotment. Stream health classification for all the streams within the allotment were not assigned since the streams are ephemeral. Diminished stream health ratings were assigned to the three springs, North Antelope Spring, The Seeps and Wells Spring because of trampling from livestock and wildlife.

Areas of concern on the allotment include:

- Three springs have concerns, North Antelope Spring, The Seeps and Wells Springs, all of which are trampled or have too small of an exclosure.

Redfern Allotment

SD DENR had assigned additional beneficial uses for Friday Gulch, Lind Gulch, Marshall Gulch, Skull Gulch, Slate Creek, Spruce Gulch and West Nugget Gulch. All of these streams, except Slate Creek, have additional designated beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters. Slate Creek has additional beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters.

No streams and headwater areas of streams within this allotment are listed in the SD DENR 303(d) list (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses.

Areas of concern on the allotment include:

- One MIM and one PFC protocols were completed on two streams. The MIM on Slate Creek indicated that there were bank stability and bank alteration concerns. The PFC was completed on Spruce Gulch had functional ratings of functional-at-risk with a downward trend. Stream health classification for all the streams within the allotment were designated as at-risk.
- On Slate Creek where a MIM was completed, bank alteration and stream bank stability is a concern. Trampling of the stream is also a concern.
- PFC rating of functional-at-risk on Spruce Gulch is a concern. Spruce Gulch has a spring without a fence with hummocking and stream trampling occurring.
- Skull Gulch has a spring with no fence with trampling and there additional is trampling along the stream.
- West Nugget Gulch, Marshall Gulch, and a tributary to Slate Creek have trampling.
- Lind Gulch has a water tank with trampling and hummocking.

Rimmer Allotment

SD DENR had assigned additional beneficial uses for Bittersweet Creek and Castle Creek. Bittersweet Creek has additional designated beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters. Castle Creek has additional beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters.

No streams and headwater areas of streams within this allotment are listed in the SD DENR 303(d) list (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses.

One MIM and three PFC protocols were completed on two streams. The MIM on a tributary to Castle Creek indicated that there were bank alteration concerns. The PFC completed on Bittersweet Creek had functional ratings of functional-at-risk with a downward trend; Castle Creek had a functional rating of proper-functioning-condition; and a tributary to Castle Creek has a functional rating of functional-at-risk with no apparent trend. Stream health classification for all the streams within the allotment were designated as at-risk.

Areas of concern on the allotment include:

- On a tributary to Castle Creek where a MIM was completed, bank alteration is a concern.
- PFC rating of functional-at-risk on Bittersweet Creek and tributary to Castle Creek are a concern. Both are being trampled and hummocking is occurring.
- Lost Park Spring fence is down and there is hummocking.

Slate Prairie Allotment

SD DENR had assigned additional beneficial uses for Crooked Creek, Lind Gulch Creek and Slate Creek. Crooked Creek and Lind Gulch Creek has additional designated beneficial uses of coldwater marginal fish life propagation waters and limited-contact recreation waters. Slate Creek has additional beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters.

No streams and headwater areas of streams within this allotment are listed in the SD DENR 303(d) list (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses.

Two MIM and seven PFC protocols were completed on several streams. The MIM on a Crooked Creek indicated that there were bank alteration concerns. On Slate Creek the MIM indicated that there were bank stability problems and bank alteration concerns. The PFC completed on Slate Creek and a tributary to Slate Creek had functional ratings of functional-at-risk with a downward trend; Crooked Creek, Dougherty Gulch and tributary to Dougherty Gulch had a functional rating of functional-at-risk with no apparent trend; and a Slate Creek and Whitetail Gulch has a functional rating of proper-functioning-condition. Stream health classification for all the streams within the allotment were designated as at-risk.

Areas of concern on the allotment include:

- On a Crooked Creek, where a MIM was completed, bank alteration is a concern and on Slate Creek bank alteration and unstable banks are a concern. Crooked Creek has trampling occurring along the length of channel with hummocking occurring.
- PFC rating of functional-at-risk on Crooked Creek, Dougherty Gulch, Slate Creek, tributary to Dougherty Gulch, and tributary to Slate Creek are a concern.
- Dougherty Gulch has trampling of the channel. Springs in drainage partially fenced with trampling occurring in wet areas. At one development the water tank is too close to stream. Another spring has fence down with trampling in wet areas.
- Mystic Camp spring has a downed fence and trampling and hummocking is occurring.
- On tributaries to Slate Creek, there are downed fences at several springs with trampling and hummocking occurring.

- Whitetail Gulch has three springs with down fences and the wet areas are impacted by trampling.

Tigerville Allotment
SD DENR had assigned additional beneficial uses for Slate Creek. Slate Creek has additional beneficial uses of coldwater permanent fish life propagation waters and limited-contact recreation waters.

No streams and headwater areas of streams within this allotment are listed in the SD DENR 303(d) list (South Dakota Department of Environment and Natural Resources, 2008). It is the responsibility of the SD DENR to determine which streams to list as 303(d) impaired, and which are not meeting beneficial uses.

One MIM and eight PFC protocols were completed on several streams. The MIM on an unnamed tributary to Newton Fork indicated that there were bank alteration concerns. The PFC completed on Gooseberry Draw, Newton Fork, Slate Creek and a tributary to Newton Fork had functional ratings of proper-functioning-condition; Burnt Fork, Marshall Gulch and tributary to Marshall Gulch had a functional rating of functional-at-risk with no apparent trend; and a tributary to Newton Fork has a functional rating of functional-at-risk with a downward trend. Stream health classification for all the streams within the allotment were designated as at-risk.

Areas of concern on the allotment include:
- On a tributary to Newton Fork where a MIM was completed, bank alteration is a concern.
- PFC rating of functional-at-risk on Burnt Fork, Marshall Gulch, Newton Fork and tributary to Marshall Gulch are a concern.
- On a tributary to Newton Fork trampling of the stream course was noted along with hummocking occurring along the entire channel. There is also a spring with the fence down. Significant hummocking is occurring near the spring.

Environmental Consequences

A list of design features that are common to all action alternatives and adaptive management strategies can be found in Chapter 2 of the EIS.

Potential effects on the proposed project, with respect to soil and water resources, may be summarized as those affecting soil productivity (compaction, erosion, heating, and nutrient removal), streams (streamflow and channel morphology), water quality (temperature/oxygen, sediment, nutrients, and pathogens), and special areas (riparian areas, wetlands, and floodplains). As discussed below, these are general effects that may occur within the allotments. Compliance with the Forest Plan and WCP Handbook standards is expected to keep these effects to an acceptable level.

The analysis area for cumulative effects was bounded in space as the allotment boundaries. The boundary was chosen because the allotments cross multiple watersheds and generally the allotment comprises a small percentage of a watershed. Subsequently, the direct and indirect effects of the grazing would be “washed-out” at the watershed scale. The cumulative effects

analysis was bounded in time to 10 years of prior through the duration of the Allotment Management Plan, approximately 15 years into the future.

Watershed Condition Classes as presented in the Forest Plan would not change whether the watersheds are grazed or not or for that matter whether the watersheds are managed or not. The condition classes on the Black Hills National Forest are more of a risk class as a large portion of the factors used in determining the rating of the watersheds cannot and would not change depending on management. These factors are erosive soils and steep slopes. The two are closely related. If you have steep slopes you generally have erosive soils when the organics are removed. Again if you have erosive soils you tend to have steep slopes. Just because you have watersheds with steep slopes and erosive soils does not necessarily mean your Condition Class of the watersheds is degraded, which is portrayed on the Black Hills National Forest. There will be no further discussion or analysis of Condition Class in this report.

There would be no direct or indirect effects on the aquatic ecosystems due to changes in the flow regime or streamflow with any alternative. Changes in flow regime would result from major changes in cover type or ground cover, dense road networks, or water projects. All alternatives are predicted to result in no major changes to these characteristics.

Stream connectivity would not be affected with any alternative because no new instream barriers would be constructed nor are any existing instream structures proposed for removal. Also all existing road and stream crossings that are a connected disturbed areas (provide sediment into the stream) would stay the same as current condition.

Floodplains would not be impacted from grazing. Grazing or the lack of grazing has no direct or indirect effects on the floodplains because no change occurs to the physical features of the floodplain. This project would meet the requirement of E.O. 11988 for Floodplain Management. There will be no further discussion or analysis of floodplains in this report.

Impacts to the soils and watershed from wildlife are expected to stay the same with all alternatives and will remain constant whether the areas are grazed with livestock or not. There will be no further discussion or analysis pertaining to impacts to the soils and watershed from wildlife in this report.

Alternative A (No Action)

Direct and Indirect Effects Common to all Allotments
Under the No Grazing Alternative, no livestock grazing would be permitted on any of the allotments. Following current Forest Service Handbook direction, existing permits would be phased out in two years. Improvements such as stock tanks, spring developments, and other water features used by wildlife would not be removed. Other improvements such as fencing, gates, and cattleguards not needed for management of allotments sharing common boundaries would eventually be removed as time and funding allows. Some of the existing sites that are not at desired condition would have a delayed response until livestock grazing stops.

Soils
An end to grazing would likely increase the ground cover initially and lead to less soil disturbance. Erosion would be reduced (due to increased ground cover), soil bulk density

(compaction) characteristics would improve, and infiltration rates would increase (to the extent that these have been affected by domestic grazing). A reduction in detrimental soil disturbance would occur most rapidly under the No Action or No Grazing alternative.

Watershed
An end to livestock grazing would likely increase the ground cover initially and lead to less soil disturbance. Livestock feces would no longer be deposited directly in streams or within upslope areas, so there would be less adverse effects on surface water quality. As vegetative cover increases, enhanced filtering mechanisms would trap more sediment and nutrients, resulting in less sediment and nutrients delivered to streams. Increased plant cover would result in greater uptake of nutrients, which would enhance water quality. However, permanent removal of grazing may not guarantee maximum herbaceous cover as the accumulation of litter over a period of years may eventually retard forage production (Buckhouse 1993 in EPA 2003).

There would be no direct effects on the aquatic ecosystems from sediment and bed and bank stability because there would be no livestock grazing with this alternative. No new direct damage to streambanks and channel morphology due to hoofshear would be expected. However, the effects of increased sediment delivery may be seen long after disturbed sites have revegetated (USDA Forest Service, 2006) and stream channels may take decades to recover from severe morphologic changes. There would a positive indirect effect because areas of localized steambank trampling and channel widening would begin to revegetate and stabilize, subsequently sediment input would decrease and bed and bank stability would increase.

There would be no direct or indirect effect on aquatic ecosystems due to temperature and dissolved oxygen changed with Alternative A because there would not be any livestock grazing with this alternative.

Riparian Areas
For all of the riparian ecosystems in the allotments, this alternative would provide the quickest and most permanent attainment of the desired condition, specific to the riparian vegetation and aquatic ecosystems where desired conditions are not currently being achieved. An end to grazing would improve riparian vegetation condition and would have a positive overall effect on the riparian areas. These improved conditions would gradually occur over decades. There would be no direct or indirect effects on riparian areas other than what has already been described above with this alternative because there would be no livestock grazing.

Wetlands
An end to grazing would have a positive overall effect on wetlands. There would be no direct or indirect effects on wetlands other than what has already been described with this alternative because there would be no livestock grazing.

Allotment-specific Direct and Indirect Effects
All of these effects would be seen on all eight allotments, except Porcupine Allotment would see a lesser amount due to the lack of streams, riparian areas and wetlands. There would be no direct effects on soils, watersheds, springs, streams, riparian areas, and wetlands because there would be no livestock grazing. There would be a positive indirect effect on soils, watersheds, springs, streams, riparian areas, and wetlands. Positive indirect effects would be by allowing all areas to revegetate and

stabilize. Springs, streams, riparian areas and wetlands would improve over time. Riparian vegetation would also have a chance to re-establish. Evidence of trampling and hummocking from livestock grazing would decrease to unobservable levels. Vegetation that was utilized by livestock would now increase ground cover and potential of sediment to reach streams via overland flow or instable streambanks would be reduced. All of these changes will occur over decades.

Bald Horse Allotment
Most streams would continue to meet water quality standards for their assigned beneficial uses. Beneficial use of coldwater permanent fish life propagation affected from temperature would not improve with the absence of grazing on Rapid Creek, Spring Creek and Victoria Creek. Rapid Creek is not currently grazed and would not be grazed with this alternative, so it would see no change. Spring Creek generally received light grazing on a 1.1 miles stretch of the stream and with no grazing on this section, improvement to the water quality would not help meet the assigned beneficial use because grazing is not the factor causing the impairment. Low streamflows and water spilling off the top of Sheridan Lake during warm summer days are the contributing factors. However on Victoria Creek, an improvement in the riparian vegetation would help move the stream toward meeting this beneficial use by providing more shade to the stream. Grazing is not the main contributing factor. Low streamflows and altered channels and riparian vegetation from a large flood event are the primary reason why Victoria Creek is not meeting the assigned beneficial use.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration, stream bank stability and trampling of Horse Creek would improve. Victoria Creek would see the functional-at-risk rating move toward proper-functioning-condition and would also see improvement in bank alteration.

Deerfield Allotment
All streams would continue to meet water quality standards for their assigned beneficial uses.

Stream health rating for Castle Creek would remain robust and Silver Creek would continue to be diminished as grazing is not the reason for the rating. Over the long-term, all the other streams would move from at-risk towards robust. South Fork Castle Creek would see the functional-at-risk rating move toward proper-functioning-condition. Bank alteration, stream bank stability and trampling of Heely Creek would improve.

Palmer Gulch Allotment
Most streams would continue to meet water quality standards for their assigned beneficial uses. Beneficial use of coldwater permanent fish life propagation affected from temperature on Spring Creek would not improve with the absence of grazing. This is because a large part of Spring Creek is on private land. There are only 2.3 miles of the 34.6 miles Spring Creek that are on this allotment. Spring Creek has had limited grazing because the locations are small isolated sections with minimal livestock access.

The implementation strategy for the TMDL on Spring Creek for fecal coliform, “Livestock access to streams should be reduced, and livestock should be provided sources of water away from streams” would be implemented to the fullest by removing livestock from this allotment.

There would no longer be fecal coliform contributions from this allotment and the beneficial use of immersion recreation affected by grazing would improve slightly with the absence of grazing.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Spring Creek stream health is expected to remain at diminished since the reason for the rating, railroad and highway, will remain unchanged. Bank alteration and trampling of Bear Gulch Creek would improve. Palmer Creek and Rabbit Gulch would see the functional-at-risk ratings move toward proper-functioning-condition and Rabbit Gulch would also see improvement in trampling.

Porcupine Allotment
There are no perennial or intermittent streams in the Porcupine Allotment so there is not a concern with the streams meeting their assigned beneficial uses.

Stream health rating for the springs of diminished may remain at this rating and not improve as the springs are the only water source for the area and wildlife is expected to continue to impact the sites by trampling the area to get water.

Redfern Allotment
All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Spruce Gulch would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition. Bank alteration and stream bank stability trampling of Slate Creek would improve.

Rimmer Allotment
All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Tributaries to Castle Creek would see the functional-at-risk rating move toward proper-functioning-condition and improvement in bank alteration. Bittersweet Creek would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition.

Slate Prairie Allotment
All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration and trampling would improve on Crooked Creek with functional-At-Risk moving toward proper-functioning-condition. Slate Creek would see an improvement in the stream bank stability, bank alteration and would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition. Dougherty Gulch would see an improvement in trampling and the functional-at-risk rating would move toward proper-functioning-condition.

Tigerville Allotment
All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration and hummocking would improve on a tributary to Newton Fork. Function-At-Risk ratings on Burnt Fork, Marshall Gulch and Newton Fork would move toward proper-functioning-condition.

Forest Plan
This alternative would comply with Forest Plan Standards & Guidelines to provide for long-term aquatic/riparian ecosystem health and ecological function. Stream bank alteration is expected to improve over time. This would benefit long-term bank stability and water quality. This alternative would eliminate grazing impacts to aquatic and riparian vegetation, allowing for continued aquatic/riparian improvement. Stream reaches and riparian areas impacted by livestock would be enhanced. Improvements will occur over decades.

Alternatives B & C

Direct and Indirect Effects Common to all Allotments.
Both alternatives would reauthorize grazing on all eight allotments. The action alternatives are designed to improve resource conditions. Structural range improvements would continue to be maintained annually and reconstructed as needed. Livestock would be moved to the next pasture before utilization standards for upland areas and stubble height for riparian areas are reached. Long-term effectiveness monitoring to assess upland and riparian condition trends will occur and adjustments made to the utilization standard and stubble height as necessary. Both alternatives include non-constructed adaptive management options to improve resource conditions. The difference between Alternative B and C is Alternative C incorporates some structural improvements designed to protect some features and/or to get better distribution of the livestock and incorporate additional constructed adaptive management options as needed to improve conditions.

Numerous hydrologic studies have upheld the conclusion that little information exists to support the benefits to soil and water from grazing (Clary and Webster, 1989). The general effects of components of the action alternatives, with respect to soil and water resources, are discussed below. Benefits and adverse effects are discussed in a general context as actual outcomes would vary depending upon how the components are employed to address specific issues. Effects of actions that are more concretely defined are discussed under the individual allotments to the extent that they could be predicted. Livestock grazing would be reauthorized on the allotments and forest plan standards will be met, especially relating to upland utilization and riparian stubble height.

Effects to the soil and watershed will be seen on all eight allotments, except Porcupine Allotment would see a lesser amount due to the lack of streams, riparian areas and wetlands. There would be direct effects (impacts) on soils, watersheds, springs, streams, riparian areas, and wetlands because there would be livestock grazing. The impacts would be minor and conditions will improve over time because of the monitoring that will occur. Short-term monitoring will focus on when the livestock will need to move based on riparian stubble height and upland vegetation utilization. Long-term monitoring of the riparian area will occur to see if the riparian conditions and stream condition area are moving in the right direction. If conditions are not moving in the right direction, adjustments will be made to grazing and short-term indicators. Springs, streams, riparian areas and wetlands are expected to improve over time and have fewer impacts from grazing. Riparian vegetation would improve. Evidence of trampling and hummocking from livestock grazing would

lesson. Ground cover is expected to improve. The potential for sediment to reach streams via overland flow or from unstable streambanks would be reduced.

Soils

There is currently minimal soil erosion problems related to livestock grazing in the project area. The action alternatives are intended to maintain or improve resource conditions in riparian and upland vegetation communities by adhering to utilization standards for the uplands and stubble height for the riparian areas. Where monitoring shows that the desired conditions at benchmark sites are not being met within an acceptable timeframe, adaptive management options will be implemented to move toward desired conditions. These actions will minimize soil erosion across the allotments.

There could be a small potential for direct or indirect effect on soil productivity from soil compaction with the action alternatives. This is because livestock would still be grazing with these alternatives. Soils susceptible to soil compaction have been identified in the Soil and Watershed Specialist Report. These soils are primarily areas that are timbered and not primary grazing land. Most any soil could be compacted under the right conditions. This happens where animals tend to congregate when the moisture conditions are right. These areas include livestock trails, salt licks, water tanks, and shaded areas. Generally these are small isolated areas already impacted and would not exceed the 15% detrimentally impacted soils as allowed under Forest Plan Standard 1103 and as demonstrated in the Soils and Watershed Specialist Report.

Watershed

The action alternatives have the potential to positively affect the watersheds. Traditionally, livestock grazing has had negative effects on aquatic ecosystem including water quality degradation, loss of stream bank vegetation and stability, and subsequent detrimental changes in channel morphology and increased sediment input (USDA Forest Service 2005a). Measures with these alternatives to maintain proper use or residual levels of vegetative cover and bank stability will promote bank stability adjacent to aquatic habitats and maintain filtering function of riparian areas adjacent to water (Guidelines 2505 and 2506).

Livestock are a source of fecal indicator bacteria in streams. Two factors that affect grazing impacts on bacterial water quality are livestock proximity and access to waterbodies and livestock density. Nonpoint sources closer to the waterbody have a greater chance to pollute the water than sources rather away. A large amount of livestock concentrated around the stream increase the chance of direct deposition of livestock waste into the waterbody. Managing the allotment to maintain ground cover across the area to reduce runoff will reduce fecal indicator bacteria from grazing lands. This is done with monitoring the riparian areas for stubble height and the uplands for utilization standards. Meeting the standards will minimize the amount of fecal indicator bacteria reaching the streams (Carlson, 2010).

A large portion of sediment from livestock comes from crossings the streams and trampling the banks while looking for water and lush vegetation. Generally the amount of sediment generated is not a large volume. However, if animals spend a lot of time in the same area of the stream, stream banks could become unstable. This could cause failure of the stream banks with large amounts of sediment being generated.

Overall these alternatives should have less impacts to the aquatic ecosystem from sediment and bed and bank stability, because of the ability to correct stream related trends through adaptive management. However, some impacts will still occur. These alternatives would not lead to detrimental bank instability. Beneficial uses of the streams and water quality standards would be met.

Riparian Areas
The action alternatives have the potential to positively affect riparian areas. Aquatic and riparian habitat at localized sites within each allotment that currently are not at the desired condition would be improved. This is anticipated to have a positive indirect benefit to streams through improved water quality and habitat conditions upon implementation of the action alternatives and adaptive management. However, the riparian areas could continue to be impacted. Changes implemented through monitoring and adaptive management are expected to maintain proper utilization levels and stubble height. Adaptive management actions are intended to move the riparian at several localized areas toward desired conditions. Riparian areas will slowly improve over time. The effects of the action alternatives on riparian areas would be more than Alternative A.

Wetlands
The action alternatives have the potential to positively affect the wetlands. As identified in the Affected Environment Section, there is potential wetland vegetation within most allotments. These wetlands are in conjunction with riparian areas along streams or springs having wetland or water-loving vegetation. Changes implemented through monitoring are expected to maintain proper utilization levels and stubble height. Adaptive management actions are intended to maintain and improve wetland conditions by reducing or eliminating livestock use. The effects of action alternatives on the wetlands would be more than Alternative A.

Allotment-specific Direct and Indirect Effects

Bald Horse Allotment
This allotment covers 27,828 acres, with 299 cows with calves permitted to graze from June 1 to October 26 each year. It is managed as a nine pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

Alternatives B and C will be addressing the riparian issue by implementing new riparian stubble height requirements, varying the order of pasture use, reducing the number of days of grazing in the Middle Horse Pasture and reconstructing three spring exclosures. These actions will improve streambank alteration in the short-term and streambank stability, hydric vegetation, width of riparian vegetation and willows will improve over the long-term. Reconstruction of the spring exclosures will continue protection of these areas from livestock impacts.

Most streams would continue to meet water quality standards for their assigned beneficial uses. Beneficial use of coldwater permanent fish life propagation affected from temperature would not improve on Rapid Creek, Spring Creek and Victoria Creek. Rapid Creek is not currently grazed and would not be grazed with these alternatives, so it would see no change. Spring Creek generally receives light grazing on a 1.1 miles stretch of the stream and even if grazing were removed from this section, improvement to the water quality would not help meet the assigned beneficial use because grazing is not the factor causing the impairment. Low streamflows and water spilling off the top of Sheridan Lake during warm summer days are the contributing factors. Victoria Creek

would not see improvement in the riparian vegetation with the continued grazing. Without the improvement of riparian vegetation the stream would not move toward meeting this beneficial use due to a lack of shade to the stream. Grazing is not the main contributing factor. Low streamflows and altered channels and altered riparian vegetation from a large flood event are the primary reason why Victoria Creek is not meeting the assigned beneficial use.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration, stream bank stability and trampling of Horse Creek would improve. Victoria Creek would see the functional-at-risk rating move toward proper-functioning-condition and would also see reduced bank alteration. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C

This alternative includes structural improvements that include fencing and water developments. The fencing will include a small corral, fencing off a pond and fencing off Sheridan Lake Road and Spring Creek. The water developments include piping water from the fenced off pond to a tank, developing an alternative water source to get better livestock distribution and developing a water source to replace the water lost from Spring Creek.

Fencing off of the pond will eliminate livestock impacts and will improve riparian conditions around the pond. Fencing off Sheridan Lake Road is to reduce the potential of livestock/vehicle collisions and will eliminate livestock access to Spring Creek. Livestock will no longer damage the stream and riparian area which will improve over time. The water developments will occur in three pastures. These will help move livestock away from streams and riparian areas providing less impact these areas.

The soils would see some additional impacts in small areas around proposed water developments, along new fence lines and inside the new corral. The proposed water developments would always have detrimentally impacted soils due to the livestock concentrations. New fences could cause new cattle trails which would have detrimentally impacted soils. The new corral could have detrimentally impact soils due to the concentration of animals in a confined area. The amount of detrimentally impacted soils on this allotment would be less than 1% even after adding these newly impacted areas to previous impacted areas.

Deerfield Allotment

This allotment covers 7,874 acres, with 102 cows with calves permitted to graze from June 6 to October 25 each year. It is managed as a six pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. It is anticipated that the time livestock are along Heeley Creek in the Heeley Pasture will be reduced from the current 60 days. Stubble height will be the factor when livestock move, not the scheduled days in a pasture as it has been in the past. This will limit the time livestock are impacting the stream and riparian area. Streambank alteration will improve in the short-term and streambank stability, hydric vegetation, width of riparian vegetation and willows will improve over the long-term. This stubble height does not just apply to Heeley Creek but also applies to all riparian areas across the allotment. The stubble height requirements

in other pastures will also dictate when livestock are to be moved which will improve stream and riparian condition across the allotment.

All streams are expected to continue to meet water quality standards for their assigned beneficial uses.

Stream health rating for Castle Creek would remain robust and Silver Creek would continue to be diminished as grazing is not the reason for the rating. Over the long-term, all the other streams would move from at-risk towards robust. South Fork Castle Creek would see the functional-at-risk rating move toward proper-functioning-condition. Bank alteration, stream bank stability and trampling of Heeley Creek would be reduced. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C
This alternative includes structural improvements that include fencing. Fencing will be along the south side of the Deerfield Road to reduce livestock/vehicle accidents. With the installation of this fence, livestock will no longer graze the Lake Shore Pasture. This would eliminate livestock access to Gold Run Creek, Deerfield Reservoir and Castle Creek. This will improve stream and riparian condition because livestock will no longer be impacting these bodies of water.

The soils could see some additional impacts in small areas along the new fence line. The proposed fence could cause new cattle trails which would have detrimentally impacted soils. The amount of detrimentally impacted soils on this allotment would be less than 1% even after adding these new areas to previous impacted areas.

Palmer Gulch Allotment
This allotment covers 14,190 acres. There are two permittees, each with a ten year term grazing permit. The north half of the allotment (4,843 acres) is grazed by 74 cows with calves permitted to graze from June 1 to October 31 each year. It is managed as a five pasture deferred rotation grazing system. The south half of the allotment is grazed by 67 cows with calves from June 1 to October 21. It is managed as a six pasture deferred rotation grazing system. Approximately 20 acres (Summit Pasture) is grazed from October 22 to May 31 with three cows and calves.

Alternative B and C would split this allotment into two allotments and reconstruct one water development. New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. Overall riparian conditions are expected to improve, with improvement in the streambank alteration and improvement in the hydric plants.

Alternative B would have a 44 day reduction in actual use on the north half because two pastures would not be grazed. The north half will be operated as a three pasture deferred rotation.

Most streams would continue to meet water quality standards for their assigned beneficial uses. Beneficial use of coldwater permanent fish life propagation affected from temperature on Spring Creek would not improve or made worse with grazing. This is because only a small part of Spring Creek is on National Forest. There are only 2.3 miles of the 34.6 miles Spring Creek that are on this allotment. Spring Creek, even though it is included as part of this allotment, has two areas accessible to livestock, would continue to be grazed lightly because the locations are small isolated sections of the allotment.

Alternative B will not change the TMDL on Spring Creek for fecal coliform unless the riparian stubble height triggers earlier movement of the livestock. The two locations along Spring Creek and three along Palmer Creek will continue to be accessed and grazed by livestock. Spring Creek is accessed from the Samelias Pasture on the north half of the allotment and livestock traditionally are in this pasture for two months. The three locations along Palmer Creek are accessed from two different pastures, one on the north half and one on the south half of the allotment. The north half of the allotment is in the Keystone Pasture and the livestock are there traditionally for two months. The south half of the allotment is on the Palmer Pasture and livestock has access to Palmer Creek for three weeks. The implementation strategy, "Livestock access to streams should be reduced, and livestock should be provided sources of water away from streams" would be partially implemented. With the reconstruction of the water development, a water source away from Spring Creek will be provided. However, there would be continued fecal coliform contributions from this allotment and the beneficial use of immersion recreation affected by would generally not be improved unless the riparian stubble height triggers earlier movement of the livestock.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Spring Creek stream health is expected to remain at diminished since most of it is on private land. Bank alteration and trampling of Bear Gulch Creek would be reduced. Palmer Creek and Rabbit Gulch would see the functional-at-risk ratings move toward proper-functioning-condition and Rabbit Gulch would also see improvement in trampling. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C

This alternative includes structural improvements including fencing, a water development, re-contouring a ditch and a stream restoration project on Palmer Creek. The fencing will include fencing four springs, fencing livestock off the Old Hill City Road, and fencing to restrict access to Spring Creek. The water development will replace the water source on Palmer Creek when the Old Hill City Road is fenced. The re-contouring of the ditch will restore a disturbed area and the stream restoration project will install steel plates to prevent downcutting and raise the water table.

Alternative C would have a 22 day reduction in actual use on the north half if privately owned cattleguards are placed across the 1880 Train tracks. One pasture (Sawmill) would not be grazed under Alternative C. The north half would be operated as a four pasture deferred rotation.

Fencing the springs will eliminate livestock impacts and will improve riparian conditions around the springs. Fencing off the Old Hill City Road is to reduce the potential livestock/vehicle collisions and will eliminate livestock access to Palmer Creek and other fencing will prevent access of livestock to Spring Creek. The re-contouring of the ditch is in the headwaters of Battle Creek and is to restore the hydrologic conditions of the area by keeping the water subsurface. The stream restoration project on Palmer Creek will install steel plates to prevent further downcutting and raise the stream elevation with the purpose to raise the water table.

The soils would see some additional impacts along new fence lines and around the water development. New fences could cause new cattle trails which would have detrimentally impacted soils. The concentration of livestock around the water development will cause detrimentally impacted soils around the water tank. The amount of detrimentally impacted soils

on this allotment would be less than 1% even after adding these new areas to previous impacted areas.

This alternative will move toward the intention of the TMDL on Spring Creek for fecal coliform. One location along Palmer Creek will not be grazed by livestock with the implementation of this alternative because livestock access will end when the livestock are fenced off of the Old Hill City Highway. Two locations along Spring Creek will not be grazed with the construction of two short sections of drift fences. The two locations along the upper reaches of Palmer Creek will continue to be grazed. Palmer Creek, which is in the Norbeck Wildlife Preserve, is grazed for 21 days of the year. The implementation strategy, for the Spring TMDL for Fecal Coliform bacteria, recommends, "Livestock access to streams should be reduced, and livestock should be provided sources of water away from streams." This would be implemented under Alternative C, reducing livestock access locations to the stream by 60%. There would still be some fecal coliform contributions from this allotment, but will be reduced over the current levels and the beneficial use of immersion recreation would be improved. This would be just a small piece of the larger picture in the watershed. However if the adaptive management option of eliminating grazing in Norbeck were to be implemented, all livestock access to Spring Creek and Palmer Creek will be achieved, reducing livestock access to the stream by 100%.

Fencing off four springs and parts of the associated riparian areas would have a positive effect. Installing the fences around the springs would decrease the stream bank trampling and hummocking around the springs. Also, it would decrease the utilization on the riparian species near the springs and cause in increase in ground cover.

Fencing of the Old Hill City Road to Keystone would eliminate a water gap on Palmer Creek, reducing soil compaction, soil erosion, reducing sediment and bacteria deliver to Palmer Creek, and increase riparian vegetation at the gap.

The restoration of the ditch in the headwaters of Battle Creek will restore the subsurface water flow and the results will increase the riparian vegetation in the area.

The restoration of Palmer Creek would raise the water table in the area thus maintaining or increasing the riparian vegetation.

Porcupine Allotment

The Porcupine Allotment has been under Holistic Management (HM) since 1988. An interdisciplinary management team meets to evaluate and plan allotment grazing use and development. The team is comprised of the permittee, and representatives from the Black Hills National Forest, Sierra Club, South Dakota Game, Fish, and Parks Department, and South Dakota State University's Range program. The management team helps to manage the relationships between land, grazing animals, and water in ways that mimic nature.

This allotment covers 9,858 acres, with 334 cows with calves permitted to graze from June 9 to September 30 each year. This permit allows variable numbers and a variable season of use to be annually applied for by the permittee. It is managed as a 12 pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

There are no perennial or intermittent streams in the Porcupine Allotment so there is not a concern with the streams meeting their assigned beneficial uses when it is grazed.

Alternative B and C will reconstruct a spring exclosure. This will continue protection of this area from livestock impacts. Impacts to riparian areas at two springs from livestock will continue. Stream health rating for the springs of diminished would remain at this rating with the continuation of grazing and no structural improvement.

Alternative C
Structural improvements include fencing and water developments. Fencing is to exclude livestock from two springs and a pasture boundary fence. The water development is new water storage and tanks with associated pipeline. Also included in this alternative is approximately 5300 acres of prescribe fire.

Fencing off two springs and the associated riparian areas would have a positive effect in reducing the impacts from livestock. Installing the fences around the springs would stop the stream bank trampling and hummocking around the springs caused by livestock. Also, the utilization, from livestock, on the riparian species near the springs would stop and cause an increase in ground cover. However, the wildlife will continue to be able to access the springs and they will continue to impact the springs in search for water. The stream health rating for the springs of diminished may remain at this rating because of the wildlife.

The soils would see some additional impacts in small areas around proposed water developments and along new fence lines. The proposed water developments would always have detrimentally impacted soils due to the livestock concentrations. New fences could cause new cattle trails which would have detrimentally impacted soils. The prescribe fire could have impacts to the soils from soil heating. Prescribe fire is conducted when the soil and organic layer moisture is elevated. This usually prevents impacts to the soils. However, this area is in the Jasper Fire and with the downed trees from this fire, the potential is there that if the logs are burned completely, the soils could be affected from soil heating. If this occurs, small impacted areas would be scattered across the landscape. These small scattered locations will not pose an erosion problem. The amount of detrimentally impacted soils on this allotment would be less than 1%, even after adding these newly impacted areas to the previously impacted areas.

Redfern Allotment
This allotment covers 11,573 acres, currently with 195 cows with calves permitted to graze from June 11 to October 25 each year. It is managed as a four pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

The total permitted use under Alternatives B and C would be 177 cow/calf pairs, reflecting a reduction of 18 pair as a result of a pending permit waiver. New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. Overall riparian conditions are expected to improve, with improvement in the streambank alteration and improvement in the hydric plants.

All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Spruce Gulch would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition. Bank alteration and stream bank stability trampling of Slate Creek would be reduced. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C
Structural improvements include fencing off one mile of Slate Creek that will be included with the Redfern Holding Pasture. This will reduce livestock access to the stream from 36 days to four days.

Installing the fence along Slate Creek would decrease the stream bank trampling and impacts to the stream and riparian area. Also, it would decrease the utilization on the riparian species along the stream and cause an increase in ground cover.

The soils would see some additional impacts in small areas along new fence lines. New fences could cause new cattle trails which would have detrimentally impacted soils. The amount of detrimentally impacted soils on this allotment would be less than 1%, even after adding these newly impacted areas to the previously impacted areas.

Rimmer Allotment
This allotment covers 2,011 acres, with 33 cows with calves permitted to graze from June 11 to October 10 each year. It is managed as a two pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

Alternatives B and C will modify the allotment by incorporating the West School Pasture from the Slate Prairie Allotment into this allotment to form a third pasture and reconstruct a spring exclosure. New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. Overall riparian conditions are expected to improve, with improvement in the streambank alteration and improvement in the hydric plants. Reconstruction of the spring exclosure will continue protection of this area from livestock impacts.

All streams would continue to meet water quality standards for their assigned beneficial uses. Over the long-term, stream health rating for the streams would move from at-risk towards robust. Tributaries to Castle Creek would see the functional-at-risk rating move toward proper-functioning-condition and improvement in bank alteration. Bittersweet Creek would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C
The alternative increases the acreage of the West School Pasture slightly and the installation of a cattleguard.

The soils would see some additional impacts in small areas around the new cattleguard. The new cattleguard could cause the cattle to concentrate which could detrimentally affect soils. The amount of detrimentally impacted soils on this allotment would be less than 1%, even after adding these newly impacted areas to the previously impacted areas.

Slate Prairie Allotment
This allotment covers 5,896 acres, with 200 cows with calves permitted to graze from June 1 to October 20 each year. It is managed as a five pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

Alternatives B and C will modify the allotment by removing the West School Pasture from the Slate Prairie Allotment into the Rimmer Allotment and reconstructing two spring exclosures. This change would reduce this allotment by 77 acres and two days of use and reconstruction of the two spring exclosures will continue protection of these areas from livestock impacts.

New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. It is anticipated that the time livestock are in the Mystic Pasture, Whitetail Pasture and Hay Draw Pasture will be reduced. Stubble height will be the factor when livestock move, not the scheduled days in a pasture as it has been in the past. This will limit the time livestock are impacting the stream and riparian area. Overall riparian conditions are expected to improve, with improvement in the streambank alteration in the short-term and streambank stability, hydric vegetation, width of riparian vegetation and willows will improve over the long-term.

All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration and trampling would improve on Crooked Creek and functional-At-Risk would move toward proper-functioning-condition. Slate Creek would see an improvement in the stream bank stability, bank alteration and would see the functional-at-risk rating with a downward trend stabilize and move toward proper-functioning-condition. Dougherty Gulch would see a reduction in trampling and the functional-at-risk rating would move toward proper-functioning-condition. These changes would be slower to occur than Alternative A because the areas would still receive some impacts.

Alternative C
This alternative includes structural improvements that include fencing. Fencing would be around the Dougherty Gulch Fen in the Whitetail Pasture. This would eliminate livestock access to the fen and protect this wetland from livestock impacts by complete exclusion.

The soils could see some additional impacts in small areas along the new fence line. The proposed fence could cause new cattle trails which would have detrimentally impacted soils. The amount of detrimentally impacted soils on this allotment would be less than 1% even after adding these new areas to previous impacted areas.

Tigerville Allotment
This allotment covers 5,825 acres, with 112 cows with calves permitted to graze from June 1 to October 25 each year. It is managed as a seven pasture deferred rotation grazing system. The term grazing permit (ten years) is issued to one permittee.

Alternatives B and C would modify the pastures by combining two and then it would be managed with six pastures, and reconstructing a spring exclosure. New riparian stubble height requirements to address the riparian issue will be implemented with Alternatives B and C. Overall riparian conditions are expected to improve, with improvement in the streambank

alteration and improvement in the hydric plants. Reconstruction of the spring exclosure will continue protection of this area from livestock impacts.

All streams would continue to meet water quality standards for their assigned beneficial uses.

Over the long-term, stream health rating for the streams would move from at-risk towards robust. Bank alteration and hummocking would be reduced on a tributary to Newton Fork. Function-At-Risk ratings on Burnt Fork, Marshall Gulch and Newton Fork would move toward proper-functioning-condition.

Alternative C
No new structural improvements are proposed with this alternative; therefore the effects are essentially the same as Alternative B.

Adaptive Management
Alternatives B and C incorporates non-constructed adaptive management options and Alternative C incorporates constructed adaptive management options into the list of possible actions. Adaptive management that follows Design Criteria, Best Management Practices, and Watershed Conservation Practices and responds to the appropriate trigger points could have beneficial effects to soil and water resources when compared to existing non-adaptive management grazing systems. Grazing system studies have shown wide variation in the ability of a particular grazing system to improve range condition. Differences in results of grazing systems studied have been inconsistent and unexplained. The problem may stem from ascribing results to a given grazing system, when in fact they are due to the whole range management program and the ability to appropriately control time and place of grazing and degree of forage utilization.

Table 3-21 lists the adaptive management options that are being included in this project. The effects of each adaptive management option as it apply to the Soil and Water resource.

Table 3-21 Adaptive Options Effects to Soil and Water Resources

Grazing Management Actions	Effect to Soil and Water
Increase or decrease stocking rate to vary grazing impacts.	Decreasing stocking rates could improve the soils, streams and riparian areas. Less numbers could mean less impact to the soils through less trampling and compaction. Less numbers could mean less sediment, nutrients and pathogens entering the stream by less stream bank alteration and less numbers in the stream introducing nutrients and pathogens. Less numbers could mean less impact to the riparian area and improved conditions through decreased grazing pressure. Increased numbers could have the opposite effect of what is outlined above.
Vary timing and duration of use based on riparian conditions.	Vary timing and duration of use of livestock based on riparian conditions is designed to improve riparian conditions. Improved riparian conditions would decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced.
Use salt or supplement to draw livestock toward or away from specific areas.	Salts or supplements to draw livestock away from areas generally mean better livestock distribution. Better livestock distribution could mean fewer impacts to the soil, streams and riparian area, by having livestock spend less time in these areas. This could decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for

Grazing Management Actions	Effect to Soil and Water
	transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced.
Incorporate a range rider to move livestock (herding).	Range riding involves actively pursuing and pushing livestock to get better utilization across the allotment and pasture. A lot of the time it is to move livestock away from riparian areas. This technique increases movements and may cause impacts to riparian areas and streambanks as livestock are driven away from these areas. Use of a range rider may help to achieve proper distribution of livestock and could reduce the amount of time that livestock spend in streams and riparian areas overall. However, much of the success of this approach depends entirely on the dependability, energy, and amount of time spent by the ranger rider.
Change season of use.	Changing season of use, instead of grazing the same time of the year all of the time, would help promote healthier riparian area, allowing vegetation to develop better and grow healthier and stronger.
Change animal numbers.	Changing animal number by decreasing the number would have a positive outcome. Fewer animals could improve the soils, streams and riparian areas. Fewer animals could mean less impact to the soils through less trampling and compaction. Fewer animals could mean less sediment, nutrients and pathogens entering the stream by less stream bank alteration and less days in the stream introducing nutrients and pathogens. Fewer animals could mean less impact to the riparian area and improved conditions through decreased grazing pressure. Increased animals could have the opposite effect of what is outlined above.
Change animal class.	Changing animal class is not going to have a large effect on the resource. Some animals could hang out more in riparian areas than others, thereby causing more impacts if not properly managed.
Change days of use per pasture.	Decreasing days of use in a pasture would have a positive outcome. Fewer days on pastures could improve the soils, streams and riparian areas. Fewer days could mean less impact to the soils through less trampling and compaction. Fewer days could mean less sediment, nutrients and pathogens entering the stream by less stream bank alteration and less days in the stream introducing nutrients and pathogens. Fewer days could mean less impact to the riparian area and improved conditions through decreased grazing pressure. Increased days in a pasture could have the opposite effect of what is outlined above.
Change number of pastures per allotment.	Increasing the number of pastures on an allotment would have a positive outcome. It would mean less days in the other pastures. Fewer days on pastures could improve the soils, streams and riparian areas. Fewer days could mean less impact to the soils through less trampling and compaction. Fewer days could mean less sediment, nutrients and pathogens entering the stream by less stream bank alteration and less days in the stream introducing nutrients and pathogens. Fewer days could mean less impact to the riparian area and improved conditions through decreased grazing pressure. Decreasing the number of pastures on an allotment could have a negative outcome. It would mean increased days in the remaining pastures. This could have the opposite effect of what is outlined above.
Split, combine, or change boundaries of allotments and/or pastures.	Splitting boundaries could have negative implications. This would mean less area for livestock to graze. To avoid the negative implications, a change in number of animals or days of use would need to occur so fewer impacts happen. The impacts could occur to the soils, streams and riparian areas. Trampling and compaction could occur to the soils. Sediment, nutrients and pathogens entering the stream could increase by more stream bank alteration and more concentrated access to the stream. More impact to the riparian area through increased grazing pressure.

Grazing Management Actions	Effect to Soil and Water
	Combining boundaries could have positive implications by spreading out the livestock over more area. The opposite of above would occur and be beneficial to the soils, streams and riparian areas.
Adjust permitted AUMs.	No grazing system would counteract the impacts of overstocking on a long-term basis (Clary and Webster, 1989). Reducing Animal Unit Months (AUMs), if necessary, could be used to achieve compliance with Forest Plan and WCP Handbook standards. Studies have shown that grazing intensity has more of an effect on both vegetation (Clary and Webster, 1989) and infiltration (Abel-Magid et al., 1987) than does the particular grazing system. However, it should be noted that reducing AUMs in the context of a variable season of use does not necessarily equate to a reduction in grazing intensity at any given site (for example, a riparian area or an area prone to compaction) during a specific timefame (such as during times of high moisture content). The benefits of a reduction in AUMs with respect to soil and water resources would depend on how AUMs are distributed in time and place.
Adjust livestock turn-out date.	Adjusting livestock turn-out date would not have an effect on the soils, streams or riparian area as long as days of use are adjusted accordingly.
Adjust livestock end of season date.	Adjusting livestock end of season date would not have an effect on the soils, streams or riparian area as long as days of use are adjusted accordingly.
Designate Forage Reserve allotments.	Forage reserve allotments could have a positive effect on the soils, streams and riparian areas. If negative effects were occurring, moving the livestock to the forage reserve would give the resource a chance to recover and improve.
Rest pasture and/or allotment from livestock grazing for one or more seasons.	If a period of rest were implemented, degraded riparian systems not able to begin recovery under current management may be able to begin the recovery process. The rest period required for recovery would depend on the type and degree of system degradation. While vegetation communities may be able to recover from excessive grazing in one to five years, degraded stream forms generally take longer to recover, particularly if the channel has become incised or confined (Platts and Raleigh 1984 in Clary and Webster, 1989). Recovery of impaired, low to moderate gradient systems generally follows a predictable response pattern with vegetation along the stream margin first increasing in vigor and density, then trapping sediment and building up streambanks. Deposition causes spreading out on the floodplain. Channel erosion is reduced, greater exchange of water between the channel, floodplain, and riparian soils takes place. With severely entrenched streams (incised streams), recovery, which is accomplished by rising the gully floor by annual deposition, may take decades. A period of rest would also allow soils to recover for compaction through cycles of wetting, drying, shrinking, and swelling; roots forcing their way through soil particles; and activities of large soil organisms and small mammals (USDA NRCS, 2001).
Do not allow livestock grazing.	Numerous hydrologic studies have upheld the conclusion that little information exists to support the benefits to soil and water of any grazing system employed (Clary and Webster, 1989). Not allowing livestock grazing would be the quickest way for the ecosystem to recover. This would decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas would be reduced.
Control and distribute livestock using water.	Getting livestock to distribute and utilize a broader area would overall benefit the soil and water resource. There would be detrimental soil impacts to the watering area, but the impacts are small and would not be a concern related to the 15% detrimental impact standard.

Grazing Management Actions	Effect to Soil and Water
Reconstruct livestock water development (i.e. springs, pipelines, tanks, windmill, sediment traps, wells, stock dams, submersible pumps, solar).	Reconstruction of water developments may result in a better distribution of livestock and draw livestock away from streams. Erosion and sedimentation may occur due to construction activities; however, these would likely be minimal and short-lived. Actual reduction in the amount of time spent in the stream should translate to reduced deposition of feces directly in the channel and less hoofshear in streambanks. This may result in improved water quality based on reduction of sediment, nutrients, and pathogens. Reconstruction of water developments could also be used to draw livestock from riparian areas that are being over-utilized. This should decrease compaction in the riparian area, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced. However, an increase in compaction or detrimentally impacted soil would likely occur at the new tank location.
Haul water to temporary tanks to influence livestock distribution.	Providing water to influence livestock distribution would improve the overall conditions because of better distribution. Improving distribution could decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced. However, an increase in compaction or detrimentally impacted soil would likely occur at the new tank location.
Utilize brush barriers to control livestock distribution.	Constructing brush barrier to control livestock distribution to keep livestock from areas of concern could be beneficial. Soil compaction could decrease, infiltration could be increased, vegetative growth could increase and the runoff could be slowed. All of this could lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced is these barriers are used to limit livestock from streams and riparian areas.
Remove existing water development.	Removing an existing water development could influence livestock distribution by concentrating them somewhere else to get water. If the water site is on a stream, impacts would occur. This could increase soil compaction, decrease infiltration, decrease vegetative growth, and speed up runoff. Decreased vegetation growth and infiltration could lead to more nutrients available for transport to streams and less of the ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be increased.
Remove existing fence line.	Removing an existing fence line would have minimal impacts to the soil and water resource, unless it crosses a stream or is in close proximity. If livestock continue to use the area, a fence that no longer crosses the stream, would not concentrate livestock at the stream. These areas with a fence could be lacking vegetation, contribute sediment, nutrients and pathogens to the stream. Removing the fence would allow the area to heal and would stop contributing sediment, nutrients and pathogens to the stream.
Implement a high-intensity/short duration grazing system.	Impact to the soil and water resource would occur, but it would be minimal because the livestock would not be there long. The soils could be compacted if the soil moisture conditions are conducive to that. Stream banks could be trampled. The benefit is that the livestock are there for a short time and then they are gone the rest of the year allowing the resource to recover.
Implement deferred or rest-rotation grazing system.	Any rest the landscape could receive would be a benefit. The soils are not impacted continuously and could receive a good layer of organic matter. This would lead to less runoff, protecting the water resource.
Restore or enhance native grass, forb, and shrub species.	Generally would not have an effect on the soil and watershed.

Grazing Management Actions	Effect to Soil and Water
Brush and clean cattle trails and fences to improve livestock access and distribution.	Improvement of livestock access and distribution would improve the overall conditions with better distribution. Improving distribution could decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced.
Change animal behavior.	Changing animal behavior could benefit the soils, streams and riparian area. Livestock that are set in their ways and hang out in the bottoms all the time could have a detrimental impact. Changing the behavior to utilize other areas could decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced.
Utilize temporary grazing permits to meet specific resource needs (fuels reduction, thistle control, reduce density of smooth brome, etc).	When utilizing temporary grazing permits to obtain certain objectives, the soils, streams and riparian areas should not receive any detrimental impacts because this would be designed and implemented to do such.
Reduce undesirable plant species by mechanical, chemical, and biological means (i.e. fringed sage, snowberry, smooth brome, cheatgrass, thistle, etc).	Reducing undesirable plant would have a positive overall effect on the ecosystem, allowing native plants to increase. This would not have a direct effect on the soils, watershed or riparian area as you do not need to have native plants to be in a healthy state. The exception would be plants that do not have roots that have holding capacity, provide for effective ground cover or take over for plants that would provide for shade for the stream.
*Adaptive options that apply to Alternative C	
Construct fence to create riparian pasture*.	Creating a riparian pasture would improve the soil, stream and riparian vegetation. Days that the livestock would be grazing the riparian areas would be limited. This would decrease soil compaction, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced. The fence may cause other problems, in that cattle trail along the fence, detrimentally impacting the soil. If the fence crosses the stream and riparian area, this would be a direct source of sediment, nutrients and pathogens.
Construct fence to exclude or distribute livestock (i.e. electric, barbwire, wooden, permanent, let-down, or temporary)*.	Excluding livestock from areas could be a good thing if these areas are heavily impacted. Soil compaction would decrease, infiltration would increase, there would be an increase vegetative growth, and runoff would be reduced. Increased vegetation growth and infiltration should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced if a stream is in the excluded area. Livestock have the tendency to walk along fences and livestock trails created may become bare paths that concentrate and accelerate runoff. These trails would become detrimentally impacted soils. If livestock trails become connected disturbed areas, they may deliver more sediment, nutrients, and pathogens to stream waters. Livestock have the tendency to walk along fences and livestock trails created may become bare paths that concentrate and accelerate runoff. These trails would become detrimentally impacted soils. If livestock trails become connected disturbed areas, they may deliver more sediment, nutrients, and pathogens to stream waters. Temporary fence may not develop permanent trails and cause as severe of problems.

Grazing Management Actions	Effect to Soil and Water
	Fencing could be used as a means to control livestock distribution to allow riparian area recovery and allow natural recovery mechanisms to occur. Increased vegetation growth should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced.
Construct livestock water development (i.e. springs, pipelines, tanks, windmill, sediment traps, wells, stock dams, submersible pumps, solar)*.	Installation of water developments may result in a better distribution of livestock and draw livestock away from streams. Erosion and sedimentation may occur due to construction activities; however, these would likely be minimal and short-lived. Actual reduction in the amount of time spent in the stream should translate to reduced deposition of feces directly in the channel and less hoofshear in streambanks. This may result in improved water quality based on reduction of sediment, nutrients, and pathogens. Installation of water developments could also be used to draw livestock from riparian areas that are being over-utilized. This should decrease compaction in the riparian area, increase infiltration, increase vegetative growth, and slow runoff. Increased vegetation growth should lead to fewer nutrients available for transport to streams and better ability of the landscape to trap sediment. Sediment, nutrient, and pathogen delivery to streams from upslope areas may be reduced. However, an increase in compaction or detrimentally impacted soil would likely occur at the new tank location.
Use prescribed fire to improve resource conditions*.	Prescribe fire has minimal impact to the soil and water resource. The fires usually do not burn hot enough to affect the soils by soil heating as there is generally an organic layer left. With the organic layer still intake, there should not be runoff impacting the streams.
Utilize Holistic Management*.	When utilizing holistic management, the soils, streams and riparian areas should not receive any detrimental impacts because this would be designed and implemented to do such.

Forest Plan

These alternatives would comply with Forest Plan Standards & Guidelines to provide for long-term aquatic/riparian ecosystem health and ecological function. Utilization standards and stubble height standards will be set for each allotment and evaluated periodically to see if conditions are improving as expected or if the standards need to be adjusted. The standards will dictate when livestock are to move to the next pasture or go home and not the scheduled time as has been the past practice. Stream bank alteration should be reduced over time. This would benefit long-term bank stability and water quality. This alternative would limit grazing impacts to aquatic and riparian vegetation, allowing for continued aquatic/riparian improvement. Stream reaches and riparian areas impacted by livestock would be improved.

Cumulative Effects

The following cumulative actions were considered common to all allotments: timber harvesting, past grazing, wildfires and associated suppression activities, roads, construction of range improvements, mining, and wildlife use of forage. Treatments of noxious weeds, OHV routes, timber harvest activities, road building, and prescribed fire are occurring presently in most allotments. In some allotments, there is use by mountain bikers and equestrians. These activities have resulted in the current soil and stream conditions.

Road-stream crossings, like culverts and low water crossings, exist within the project area. These crossings can provide areas of stream instability through the instream structures and areas where sediment could readily enter the stream. Areas where sediment may enter the stream channels are

called connected disturbed areas (CDAs). Road-stream crossings could also fragment the stream network.

Recent increases in off-highway vehicle (OHV) use has resulted in localized bank stability impacts on user-created trails where OHV's cross perennial streams or created CDAs. These types of impacts occur within every allotment except Porcupine Allotment, where there are no perennial streams. There are notable OHV impacts on Heeley Creek within the Deerfield Allotment. Decisions on travel management are outside of the scope of this project.

Soils

Detrimental soil disturbance caused by grazing for each allotment was displayed under the Existing Condition section. All allotments were estimated to have detrimental soil disturbance below 1% due to grazing. These estimates took in to account trailing along the fence lines and drainages as well as impacts from water developments and salt licks. Past, present, and reasonably foreseeable effects for soil compaction could occur from past grazing, timber activities, and OHV routes. All effects would continue into the future except grazing would not continue under Alternative A. As explained already, the expected detrimental soil compaction due to livestock grazing is less than one percent of the allotments is already occurring and is not expected to exceed one percent. Even if the impacts from grazing were to double, detrimental impacts would still be less than one percent. Adding the impacts from grazing, timber activities, and OHV routes, the cumulative effects to soil productivity from soil compaction is expected to be within Forest Plan Standard 1103 and not exceed 15%.

There is no planned removal of humus, topsoil, leaves or limbs within any of the allotments. There would be no cumulative impacts to the soil productivity with nutrient removal.

There would be no cumulative effects to the soils because the effects are already occurring, will continue to occur in the same places and are not expected to increase with the implementation of any alternative.

Watershed

Past, present, and reasonably foreseeable activities that impacts the watershed include, fires (natural or prescribed), roads and trails, mines, livestock grazing and big game (elk/deer). Past impacts to the aquatic ecosystem from sediment traditionally come from roads. Bed and bank stability impacts traditionally come from grazing and placer mining, but could also be associated to roads.

Currently, three bodies of water within the project area are listed as impaired for cold water permanent fish life propagation because of temperature from an unknown source unrelated to grazing. These three streams are Rapid Creek, Spring Creek, and Victoria Creek. These streams are within the Bald Horse allotment. The area around Rapid Creek is not grazed because there is no livestock access to the stream due to the terrain and a decision not to graze in the Pactola Basin. Spring Creek receives light grazing and Victoria Creek is in the middle of this allotment and is grazed. Spring Creek on the Palmer Gulch allotment is listed as impaired for cold water permanent fish life propagation because of temperature and also impaired for immersion recreation due to bacteria. The area around Spring Creek on Palmer Gulch allotment is lightly grazed as these parcels are isolated and not easily accessible to livestock due to terrain or private land patterns.

The project area is a multiple use area and other activities (other than grazing) contribute to water quality impacts. Other ongoing activities within the project area include roads, prescribed fire, vegetation management, noxious weed management, mining, recreation and OHV use, and timber harvest. Grazing has been occurring in the project area for many years (>100). Over that time, livestock numbers have been reduced and improved grazing management has occurred.

There would be no cumulative impacts to the aquatic ecosystems from changes in flow regimes because the lack of direct and indirect effects would not result in an additive incremental impact.

Past, present, and reasonably foreseeable impacts to the aquatic ecosystem from temperature/oxygen traditionally come from widening of the stream or removal of streamside vegetation. There would be no cumulative impact to the aquatic ecosystem from the temperature/oxygen parameter, because any change from implementing the alternatives would be negligible but would be an improvement. Also, any cumulative impact would be difficult to detect because of the effects are already occurring and would be overshadowed by rainfall variability (drought) and dams.

Riparian Areas

Past, present, and reasonably foreseeable activities that impact the riparian areas of the allotments include livestock grazing, roads and trails within or adjacent to riparian areas, mining, and big game. Riparian areas are associated with water and livestock need water and preferentially select these succulent plans. If livestock are not managed properly they have a detrimental impact to riparian areas, especially if they are allowed to loiter and the areas are grazed for extended periods of time. Effects related to the road network and travel management may be expected to continue but may be reduced by the decision on Travel Management and OHV use on the Black Hills National Forest (ROD March 22, 2010). Effects from mining have been in the past and the present activities on the forest generally do not impact riparian areas. Effects from wildlife browsing/grazing are likely to continue at current levels. All of these things have contributed to impacts to the riparian areas cumulatively and additional impacts are not expected because they have already and will continue to occur.

Floodplains

Past, present and reasonably foreseeable activities that impact the floodplains are primarily associated with roads. Since there are no effects to the floodplains within the any of the allotments from grazing, there are no cumulative impacts to the floodplains.

Wetlands

Past, present, and reasonably foreseeable activities that impact the wetlands are primarily associated with livestock grazing, big game, roads, and non-system routes. Wetlands are associated with water and livestock need water and preferentially select these succulent plants. If livestock are not managed properly they could have a detrimental impact to riparian areas and wetland vegetation, especially if they are allowed to loiter and the areas are grazed for extended periods. Effects from big game browsing/grazing are likely to continue at current levels, though the effects are undoubtedly less dramatic than domestic livestock. Roads and non-system routes are currently being addressed through the forest wide travel management planning effort. All of these things have contributed to impacts to the wetlands cumulatively and additional impacts are not expected because they have already and will continue to occur.

Summary
Alternative A is the best alternative for the soil and water resource. There will be no livestock grazing to impact the resource. Impacted to soils from livestock will stop and the soils will start to recover. The riparian area and streams will no longer receive any impacts and begin recovery without continued use by livestock.

Alternative B will protect the soil and water resource. Forest Plan Standards will be implemented and met. Soils will continue to be impacted where livestock are concentrated but the amount of detrimentally impacted soils will be less than 1%, well below than the standard of 15% outline in Forest Plan Standard 1103. The riparian area and stream will see improvements over time with improved streambank alteration, streambank stability, hydric vegetation, width of riparian vegetation and willows. However, with the continued use of these areas, recovery to desired conditions will be slower than Alternative A. Long-term monitoring will be conducted. If the trends of the long-term monitoring are not headed in the right direction, upland utilization and riparian requirements will be adjusted, i.e. the four inch stubble height is increased to six inches. With this check, this will assure that the riparian areas and streams are improving and moving in the proper direction toward the desired conditions.

Alternative C is very similar to Alternative B. The difference is that there will be certain areas that will be protected from livestock grazing. Because these areas will not receive any or receive reduced livestock grazing, these areas will recover to desired conditions quicker.

SOCIAL ENVIRONMENT

HERITAGE

Introduction
National Forest Service System lands surveyed within the grazing allotments/project area were identified according to the Rangeland Management Activities Memorandum of Understanding (MOU) between the Forest Service Rocky Mountain Region and the South Dakota State Historic Preservation Office, (SHPO). Stipulations outlined within the MOU require the consideration of cultural resources that fall within areas where the high susceptibility for livestock impact overlaps areas of high potential for cultural sites. Level I (literature searches) and Level III cultural resource inventories were conducted for each allotment between 2001 and 2004 by Forest Service Heritage personnel. Forest Service Policy (FSM 2361.3) requires that projects with the potential to affect heritage resources be surveyed for heritage resources in order to comply with 36 CFR 800; the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969; Executive Order 11593 of 1971; the American Indian Religious Freedom Act of 1978; and Archaeological Resource Protection Act of 1979. These reports are filed in the Black Hills National Forest Supervisor's Office, Custer, South Dakota; and with the State Historic Preservation Office (SHPO), Pierre, South Dakota and are not available for general public review [16 U.S.C. 470hh(a)]. Site location and descriptive information is excluded from the Freedom of Information Act based on the Archeological Resources Protection Act (5 U.S.C. 551; Public Law 96-95, Section 9). All significant historic and prehistoric properties would be protected by following the heritage resource compliance process mandated by Section 106 of the National Historic Preservation Act (NHPA) and the recommendations outlined in the heritage resource reports. The regulations governing Section 106 review are contained in 36 CFR Part 800, which describes the compliance process.

Existing Condition

The Mystic Range Project area contains numerous archeological and historical sites that represent various aspects of occupation in the central Black Hills. The Black Hills have a rich and diverse cultural heritage. Numerous tribes have roots in the Black Hills. Native American sites include open campsites, stone tool quarry sites, rock shelter locations, and spiritual and traditional use sites. Archeological evidence suggests the earliest known use of the area occurred about 10,000 years ago. American Indian sites are valued both for their ability to teach us about how these past peoples lived, and to help American Indian people today maintain cultural and religious traditions. Historic sites (which date to about the last 125 years) constitute the most visible connection to past peoples on the Forest, and are valued both for their ability to enrich local family and community history and for their contribution to our understanding of environmental change since European-American settlement. For example, past activities, such as water diversion, exclusion of fire, timber harvest, and grazing, have caused changes to Forest biotic communities that continue today. Knowing when and how these changes have occurred helps to create more effective management actions today. Historic land use in this area has occurred since the 1800s in the form of homesteading, trapping, livestock grazing, and mining, as indicated by the GLO and Land Status plats. This activity primarily took the form of ranching from homesteads found along the better streams. Logging, mining, hunting, horseback riding, off highway vehicles, and other recreational uses continue to be popular in this area.

Heritage resource inventories for the Bald Horse, Deerfield, Palmer Gulch, Porcupine, Redfern, Rimmer, Slate Prairie, and Tigerville allotments on the Mystic Ranger District were completed between 1999 and 2004. Both Level I files searches and Level III field inventories were used to identify heritage properties that could affected by grazing activities. Areas identified for survey in each of the allotments were those areas where a high susceptibility for livestock impact overlaps areas of high potential for cultural sites.

Previously recorded National Register of Historic Places (NRHP) eligible sites were monitored for effect in all allotments. Livestock grazing was found to have a significant impact on two NRHP eligible heritage properties in the Bald Horse allotment. The purpose of the inventories was to identify, and inspect all of the NRHP eligible and unevaluated heritage resource properties for effects from livestock. Ineligible sites are dropped from management concerns, and determinations of effect on these properties are not addressed in this analysis.

A total of 125 eligible/unevaluated sites are located within the boundaries of the eight allotments: 67 in Bald Horse, 11 in Deerfield, 10 in Palmer Gulch, five in Porcupine, 21 in Redfern, one in Rimmer, five in Slate Prairie, and five in Tigerville. These sites include historic cabins, flumes, railroads, mining camps, CCC camps, and historic and prehistoric habitation sites.

These areas have the potential to contain Traditional Use Sites. Tribes have been contacted about general concerns for resources in this area. The information provided to the tribes included an analysis description, and locational information on known archeological sites, however, no response has been received identifying concerns for spiritual or traditional use properties. Specific areas of concern for the heritage resource program include the protection of eligible (sites considered significant in the history of the area, state, or country) and unevaluated (sites that have not been evaluated for their significance) archeological/historical sites, appropriate consultation

with local American Indian groups, and the protection of spiritual sites, Traditional Cultural Properties (TCPs), recent and historic graves, and Euro-American cemeteries.

Heritage resource effects were qualitatively assessed through a presence/absence determination of significant cultural resources and mitigation measures to be employed during grazing activities and prescribed fire (broadcast burning. The affected environment includes both known heritage resource sites and sites that would be located in the future as more of the Forest is surveyed. Most of these surveys and site documentations have been done in order to evaluate the effect of other projects (e.g., timber or range projects) on heritage resources.

Management actions that can adversely affect heritage sites include anything that might significantly change the important features of a heritage site, and include any kind of ground disturbing activity or historic building maintenance. Under all alternatives, there is a potential for management actions to lead to adverse effects on heritage sites. These potential effects would be identified as part of addressing the requirements of Section 106 of the National Historic Preservation Act and National Environmental Policy Act (NEPA) analyses under all alternatives. When effects are analyzed as part of project planning, there is also the opportunity to redesign the project to avoid those sites or adverse effects, or if necessary, mitigate them. Non-project specific effects, such as wildland fire or the illegal use of off-road vehicles, have the greatest potential to adversely affect heritage resources in the long-term. These effects are not as easy to anticipate, avoid, and/or mitigate.

There is also the potential for management decisions to positively affect heritage sites through such things as interpretation (i.e. signs) and general watershed health. An active Heritage Program benefits heritage sites directly through implementation of Heritage Strategies, which emphasize Stewardship (identifying and protecting significant sites), Public Service (providing opportunities for people to enjoy their heritage), and Context for Natural Resource Management (applying heritage information to all areas of management). These activities include locating, documenting, and evaluating the importance of sites (most commonly through determination of their eligibility for the National Register of Historic Places). Management actions also include stabilizing log structures, relocating trails or roads that run across sites, using sites appropriately, etc. These uses include enhancing visitors' understandings of the past (through research or interpretational programs), stabilizing sites as protected features for the future, or ensuring that American Indians can continue traditional uses of sites.

Environmental Consequences

The evaluation criteria to analyze the effects of grazing on heritage resources are based on disturbance to the resource and the qualities which make it eligible to the NRHP. The effect of grazing on heritage sites was considered and the disturbance was determined to occur where livestock concentrate and cause a change in the surface and sub-surface conditions. Areas where livestock concentrate occur along fence lines, corrals, and water developments.

Alternative A (No Action/No Grazing)

Alternative A is the no action/no grazing alternative. Under this alternative, grazing would not be reauthorized and the current permit holders would be notified that their term grazing permits would be cancelled. All term grazing permits would be cancelled after two years, pursuant to Forest Service Handbook (FSH) 2209.13 part 16.24, and Code of Federal Regulation (CFR) 36 CFR

222.4(4)(1). The FSH and CFR regulations indicate that a two-year notification is required prior to cancelling a permit, except in emergency situations.

The no action alternative would close eight allotments, eliminating livestock grazing from 85,055 acres of National Forest System lands. Permits would not be issued for any of the eight affected allotments unless a subsequent NEPA analysis and decision to restock the allotments was made.

Maintenance of range developments on the allotments would no longer be the responsibility of the permittees. Developments built to facilitate livestock management, including allotment and pasture fences, livestock enclosures, and stock water ponds and water troughs would be abandoned. Permittees who participated in the development of range improvements would be reimbursed for their amortized share, consistent with direction in FSH 2209.13, Chapter 70. Developments built to reduce wildlife effects to resources, such as water developments and big game enclosures, would remain in place and would continue to be maintained. Maintenance of unassigned allotment boundary fences would be assigned to the adjacent permittee.

The following structural improvements would be abandoned:

- Approximately 145 miles of interior pasture fence.
- 219 water developments.
- Nine miles of pipeline associated with water developments.

Spring boxes and underground pipes associated with water developments would be abandoned; pipes would be disconnected. If left in place, pipes would be capped on one or both ends to prevent water from flowing through the pipes.

Direct and Indirect Effects

This alternative would not cause any direct effects to heritage resources by livestock grazing activities in all allotments. An indirect effect could possibly result from the fact that the no action alternative would not provide for any mitigation measures for resource protection, the stabilization of currently affected sites and/or effects from not grazing the vegetation cover may lead to more intense burning in the event of a wildfire. Intense wildfire can affect both historic and prehistoric properties.

Alternatives B

Alternative B would reauthorize grazing on all eight allotments. Changes would be made to some of the allotments. Structural range improvements would continue to be maintained annually, and reconstructed as needed. No additional range improvements would be authorized or constructed.

The actual season for livestock use may be less than permitted based on annual variations in weather and range readiness, and the rate at which utilization standards are met. The grazing season may be less than permitted.

Alternative C (Proposed Action)

Livestock grazing would be reauthorized and term grazing permits would be issued for eight allotments. Alternative C is designed to maintain or improve resource conditions using a full suite of options, including construction of new structural improvements, such as fences, cattleguards, and water developments.

The State Historic Preservation Office has concurred with the recommendation that sites eligible for the NRHP require monitoring and possible additional management strategies (e.g. fencing) to avoid possible adverse effects. Alternative C allows for site management options recommended within the cultural resources reports to be implemented, as well as possible implementation of general adaptive management options. Any additional heritage resources that may be discovered during range related projects or adaptive management action implementation would be protected based on the recommendations of the District Archeologist and the State Historic Preservation Office, and all sites would be evaluated. Adaptive management actions listed in Table 2-1 have been reviewed for impacts to archeological resources. Most measures would have minimal to no impact the resource with the exception of ground disturbing activities located within NRHP eligible site boundaries.

Direct and Indirect Effects for Alternatives B and C

There are no direct/indirect effects to heritage resources under Alternative B. General effects to heritage resource sites under Alternative C include site specific changes to and/or the installation of new range improvements. The following number of sites within each allotment has the potential to be adversely affected: two sites in Bald Horse, two sites in Palmer Gulch, two sites in Porcupine, one site in Slate Prairie, and two sites in Redfern. With the implementation of mitigation measures and effective monitoring of those measures (see Appendix B); the effects are expected to be minimal and would protect heritage resources over the long term.

In addition, prescribed fire is proposed under Alternative C for the Porcupine Allotment in the amount of 5,300 acres. Forest Plan Standard 4102 provides for the protection of heritage resources within fire areas. Following the Jasper Fire in 2001, large amounts of slash has built up over time. As a result, the slash hinders grazing by covering areas which would normally be grazed. The proposed prescribed fire would reduce slash and aid in the distribution of livestock and therefore even the utilization. Effects from wildfire are known to be greater to heritage resources than are the low intensity burns that accompany prescribed fire efforts (Jackson 1997). Wildfires tend to have greater flame lengths and often burn more intensely. Such fires would likely require bulldozers or indirect suppression tactics, such as burnout operations or retardant drops, to contain. Sites that are susceptible to fire include those with flammable elements and/or rock features, such as rock art, which are subject to spalling (chipping or breaking of rock through heat).

The careful application of prescribed fire can benefit heritage resource management: 1) prescribed fire reducing fuel loadings and fuel densities; 2) lower fuel densities reduce the potential for hotter uncontrolled wildfires; and 3) prescribed fires burn away materials from the surface and provide for better visibility.

Cumulative Effects Common to all Allotments

Cumulative effects analysis for heritage resources considered all lands that fall within the allotment boundaries. Livestock grazing and grazing improvements have less impact to cultural resources than other ongoing forest uses like recreation, camping, and off-road vehicle use. The action alternatives provide for heritage resource protection and mitigation which would not cause sites to be adversely affected by livestock grazing.

Traditional Use

Existing information about heritage and cultural values may often be inadequate; ongoing inventories tend to be project-specific rather than part of the general program. Obtaining information about traditional use sites from some American Indian groups is difficult because the

Forest Service styles of communication and negotiation are often incompatible with these cultures and revealing traditional values and identifying traditionally used places to outsiders may be thought to imperil the values in need of protection. The ability to identify and protect sacred sites is heavily dependent on tribal representatives sharing information with the Forests. The heritage resource specialists can and do identify cultural material but it is critical for the tribes to provide cultural information. The Forest has been made aware of sacred sites on other parts of the Forest and we are currently protecting these types of sites Forest-wide.

A range of traditional American Indian resources has been identified within the Forest. American Indian groups throughout the region consider the Black Hills a source of spiritual importance (USDA Forest Service 1996b p. 1b-37; p. 3a-1 through 3a-16). Sacred places can include topographic features such as buttes, mountains, valleys, rocks, springs, and caves. People who use sacred places often consider them sensitive, so the specific names and locations of sacred places are not always released to the public. It should be noted that the within the preservation laws and regulations that we work under, the terms sacred site and Traditional Cultural Property (TCP's) refer to two distinct categories of sites. TCP's are formally documented sites using criteria defined in the Secretary of Interior's Bulletin #38. To formally document and protect a TCP extensive oral history specific to that site must be collected and documented. There are a number of criteria that documentation must adequately address in order for a site to be classified as a TCP. Sacred sites do not require the same level of documentation. No Spiritual Sites, Traditional Cultural properties, or traditionally used flora and fauna were identified or made known to the Forest Service

Access

For those areas that contain traditional use sites, access needs would be high for traditional groups utilizing the area. This is particularly true for tribal elders, who may have difficulty accessing areas for physical reasons. The ability to access Tradition Cultural Properties, Sacred sites, traditional use areas, or traditional plant gathering areas is guaranteed under the American Indian Freedom of Religion Act (AIRFA) and under Executive Order 13007, and the Agency must not impede access to such locations.

Consultation

The Heritage Resource Reports were sent to the South Dakota State Historic Preservation Office of Review and Compliance for comment and eligibility determinations for the heritage resources located within the analysis area. The SHPO letter dated October 26, 2009, has concurred with the determination of "No Historic Properties Affected". Likewise, the reports were also sent to Tribal Historic Preservation Offices and tribal groups requesting the reports, for their review and comment, and additional recommendations for the protection of American Indian traditional use sites. Follow up contact was made with the Tribal representatives, either no additional information was received or there were no concerns on the environmental document. Prescribed burning in the Porcupine Allotment has not received SHPO concurrence. This concurrence is needed prior to implementation.

Conclusion

Consultation with all appropriate historic preservation offices and consulting parties has been entered into pursuant to Section 106 of the National Historic Preservation Act. If additional site elements or new discoveries are found during project actions (inadvertent discoveries), the new elements or discoveries must be assessed according to the guidelines established in 36 CFR 800.

SOCIAL / ECONOMICS

Affected Environment

The analysis of economic effects identified the counties and communities with economic dependencies associated with livestock grazing on the Black Hills National Forest, in particular, the Mystic Range Project area. Communities with economic dependencies were defined as those communities with economic sectors that have ties to the grazing on the Black Hills National Forest in particular on those allotments in the Mystic Range Project area. For the purposes of this analysis, only those communities located most closely to the Black Hills National Forest were included in the analysis. The counties considered most vulnerable to decisions within the Mystic Range Project area are Pennington and Custer Counties, SD. All eight of the allotments are located in Pennington County, SD, with a portion of the Porcupine Allotment in Custer County. The communities of Rapid City and Hill City, SD, were considered those most likely to be affected based on their proximity to the project area in Pennington County and the town of Custer is the community most likely to be affected in Custer County. Rapid City is the largest community (pop 59,607) in Pennington County, South Dakota.

Every county's economy is fueled by one or more sectors that provide jobs and income throughout the area. Jobs and income are dependent upon the size and vitality of these economic sectors. The health of the economy is dependent not only on strong economic sectors but upon a diversified range of sectors. If a county's economy is heavily dependent on only one industrial segment, it may be vulnerable to declines in prosperity if business conditions for that industry turn downward. Economies that are diversified are more resilient and far less vulnerable to downturns resulting from adverse conditions in any one sector.

In 2001in Pennington County, agriculture (combined with forestry,) accounts for about 2.3 percent of jobs (http://censtats.census.gov/data/SD). These jobs represented >1.0% of personal income (http://www.bea.gov). The population of Pennington County is 88,565 and Custer County is 7,275 based on Demographic Information (U.S. Census Bureau 2000). From 2000 to 2006, Pennington County population increased by 5.1% and Custer increased by 7.4%. Growth rate from 2000 to 2006 was fairly homogeneous ethnically and racially (U.S Census Bureau 2000). Ethnicity is predominantly Caucasian in Pennington County (86.7%) and Custer County (94.2%). The median age in Pennington County was 35 years old and in Custer County the median age was 43.2 in 2000. These agriculture based numbers are understated due to the large agriculture dependence of surrounding counties and the substantial indirect effect on the retail, medical, education, and other expenditures made within the Rapid City regional trade center. Custer County has a higher percentage of its economy directly tied to agriculture.

Geography

Pennington County encompasses 2,776 square miles of land area out of 75,885 total square miles in the state of South Dakota. According to data from the census year 2000, there were 32.0 people per square mile in Pennington Country compared to 10.0 people per square mile as an average across the entire state. Custer County comprises 1,558 square miles with a population density of 4.7 people per square mile compared to an average population density of 10.0 people for the state of South Dakota as a whole.

Employment and Income
In 2000, agriculture, forestry, fishing, hunting and mining comprised 2.3% of employment in Pennington County and 12.2% in Custer County (U.S. Census Bureau 2000). Employment information for strictly agriculture or ranching in South Dakota is not available.

In 2007, the unemployment rate in Pennington and Custer Counties were 2.8% and 3.0, respectively, compared to 3.0% for the state and 4.8% for the nation (SD Governor's Office of Economic Development 2007), these numbers may be higher today. Both counties have fairly diverse economies with service, mining, ranching, retail, construction, government, professional, and education-related jobs contributing to the economic base. Agriculture is a smaller portion of the economy than it once was, but adds to the diversity of the county and the surrounding communities. Income from ranching is highly variable.

Ranching operations in the area often operate at a loss or close to the margin and the profitability can be significantly affected by a variation of market conditions. If access to federal lands for grazing is altered significantly, this change could affect ranching profits and overall business viability. Most of the animals that currently graze on the Black Hills National Forest (including on these allotments) are beef cattle. They are part of the ranching and farming economic base for the area. Statewide, as of 2007, there were 3.7 million head of cattle. South Dakota is nationally ranked 8th in exports of live animals and meat (SD Agriculture 2008).

Social Environment
In addition to the economic factors, ranching contributes to the social fabric of the area. It is an important part of the people's heritage in both Pennington and Custer Counties. Ranching has a long history in the local communities dating back to the late 1800s. Many of the local ranching families are direct descendants of the area's earliest settlers while others have moved to the area more recently. The Mystic RD allotments support seven permittees and their families. The use of the National Forests has been an integral part of the management of these ranches for many years and contributes to the viability of their agricultural operations.

Grazing Fees
The Public Rangelands Improvement Act of 1978 declared that "vast segments of the public rangelands are producing less than their potential for livestock, wildlife, habitat, recreation, forage, and water and soil conservation benefits . . ." The act further declared that ". . . to prevent economic disruption and harm to the western livestock industry, it is in the public interest to charge a fee for livestock grazing permits and leases on the public lands which is based on a formula reflecting annual changes in the costs of production . . ." Guidance for implementation of grazing fees is found in 36 CFR 222. Subpart C. These regulations state that: ". . . the calculated grazing fee for 1988 and subsequent grazing fee years represent the economic value of the use of the land to the user and is the product of multiplying the base fair market value of $1.23 by the result of the annual Forage Value Index, added to the sum of the Beef Cattle Price Index minus the Prices Paid Index and divided by 100: provided, that the annual increase or decrease in such fee for any given year shall be limited to not more than plus or minus 25 percent of the previous year's fee, and provided further that the fee shall not be less than $1.35 per head per month."

While that act established that grazing on public land was in the public interest, it did not require that the grazing programs administered by land management agencies, such as the Forest Service, achieve a profit from grazing.

Environmental Effects

Direct and Indirect Economic Effects

The economic analysis was assessed on an allotment-by-allotment basis to assist the decision maker in utilizing this information to make a decision for each allotment. Although the economic benefits of the project as a whole have some value in assessing the overall costs of the range program, such an analysis, would have little value in making choices between alternatives for the individual allotments. Also, some allotments have substantial differences between alternatives while there is essentially no economic difference between alternatives for other allotments. Thus, combining the allotments into a single economic analysis would not accurately portray the differences between alternatives.

The Quicksilver economic program (USDA Forest Service 2010a) was used to compare the economic costs of the proposed action and the alternatives to both the Forest Service and the range permittees. Costs were calculated for both the permittee and the Forest Service separately because certain grazing practices are more costly to one or the other. For all alternatives, the analysis considered costs associated with grazing on the Forest. Costs to the Forest Service include permit administration, monitoring range conditions, and any costs of improvements provided by the Forest Service. Costs to permittees include hauling livestock, herding, salting, incidental livestock mortality, veterinary costs, construction of range improvements, maintenance and reconstruction of range improvements, and grazing fees. The value of the weight gained by livestock while grazing on NFS lands was not included as a benefit in this analysis because it is dependent on many factors that vary between allotments and permittees. This includes the breed of livestock, management strategies while on private lands, market conditions at the time of sale and other factors. Because the value of weight gained on NFS lands is the ultimate benefit and it was not used in the analysis, the comparison between alternatives portrays the relative costs to permittees. This method also gives a valid comparison of the total cost to the Forest Service for grazing these allotments under each alternative. The results of the cost analysis for each alternative and allotment are displayed in the following tables. For analysis purposes, all reconstruction and construction costs are assumed to be paid by the permittee.

Table 3-22 Costs Associated with Alternative A.

Alternative A Allotment	FOREST SERVICE		PERMITTEE	
	Cost per Year	Total Cost**	Cost per Year*	Total Cost*
Bald Horse	$11,186	$111,186	$27,606	$55,213
Deerfield	$6,934	$69,340	$9,615	$19,230
Palmer North	$3,561	$35,610	$8,174	$16,348
Palmer South	$4,532	$45,320	$7,698	$15,397
Porcupine	$11,155	$111,556	$20,133	$40,266
Redfern	$5,357	$53,574	$15,051	$30,102
Rimmer	$1,889	$18,898	$4,926	$9,852
Slate Castle	$4,156	$41,564	$15,812	$31,624
Tigerville	$5,252	$52,526	$10,485	$20,970
Total	$54,022	$539,574	$119,500	$239,002

*Cost / Year and Total Cost for the permittee is based on two years.
**Forest Service Total cost is based on 10 years.

Table 3-23 Costs Associated with Alternative B.

Alternative B Allotment	FOREST SERVICE		PERMITTEE	
	Cost per Year	Total Cost*	Cost per Year	Total Cost*
Bald Horse	$4,380	$43,800	$25,887	$258,874
Deerfield	$4,016	$40,160	$10,356	$103,564
Palmer North	$3,548	$35,480	$9,674	$96,740
Palmer South	$4,016	$40,160	$8,334	$83,342
Porcupine	$5,108	$51,080	$22,821	$228,212
Redfern	$4,016	$40,160	$16,942	$169,423
Rimmer	$5,160	$51,600	$5,380	$53,803
Slate Castle	$6,564	$65,640	$17,368	$173,689
Tigerville	$5,160	$51,600	$11,686	$116,862
Total	$41,968	$419,680	$128,448	$1,284,509

*Total cost is based on 10 years.

Table 3-24 Costs Associated with Alternative C.

Alternative C Allotment	FOREST SERVICE		PERMITTEE	
	Cost per Year	Total Cost*	Cost per Year	Total Cost*
Bald Horse	$4,380	$43,800	$29,769	$297,696
Deerfield	$4,016	$40,160	$12,915	$129,148
Palmer North	$3,548	$35,480	$12,487	$124,873
Palmer South	$4,256	$42,560	$8,810	$88,103
Porcupine	$5,108	$51,080	$26,111	$261,116
Redfern	$4,016	$40,160	$19,023	$190,236
Rimmer	$5,160	$51,600	$7,288	$72,887
Slate Castle	$6,564	$65,640	$17,635	$176,351
Tigerville	$5,160	$51,600	$11,746	$117,462
Total	$42,208	$422,080	$145,784	$1,457,872

*Total cost is based on 10 years.

Alternative A

Under Alternative A, grazing would be eliminated on all eight allotments after two years. Whether the permittees would continue to maintain their business in a reduced form or supplement the forage loss through other means could depend on several factors. The permittees may choose a number of different options to provide forage previously provided by these allotments. They may choose to: 1) graze on their own properties if they have sufficient land; 2) find and graze on other private land at a fee; 3) use alternative sources of feed, such as purchasing hay; or 4) reduce the size of their herds to reduce their demand for forage.

Eliminating livestock from these allotments could affect the economic viability of the livestock operations because of the additional costs associated with securing additional range or buying supplement feed to accommodate herd sizes consistent with current permitted numbers. Additional costs could include the possibility of additional fencing, establishment of water on newly acquired range, along with increased trucking and labor costs associated with moving and otherwise handling livestock. Reduced economic viability of ranching operations could result in loss of the business itself.

There is an increasing trend in subdivision of farms and ranches into “ranchettes” or “exurban housing developments” (Knight et al., 1995; Mitchell et al., 2002; Maestas et al., 2002; Maestas et al., 2003; Hansen et al., 2005; Talbert et al., 2007; Knight, 2007). Such land conversion can have a variety of socio-economic impacts, including increase of invasive species and decrease of

native species, species richness, and biodiversity (Maestas et al., 2002; Maestas et al., 2003; Hansen et al., 2005), an increase in land management issues, such as access, rights of way, water rights, liability, public relations, and infrastructure (Knight et al., 1995), increase social issues like free-ranging dog and cat populations, vehicle traffic, light pollution, and human density (Mitchell et al., 2002), and an increase in per-capita costs to county governments and school districts (Knight, 2007). If large tracts of private land that are adjacent to public land are subdivided, this reduces the buffer between public land and urban development and fragments the landscape (Mitchell et al., 2002).

The level of risk of a ranching operation failing under Alternative A is unknown, and would be dependent upon a variety of factors, including the overall economic condition of the local area, and each ranch's ability to access economically feasible alternatives to grazing on public land.

In Alternative A, the Forest Service would no longer receive grazing permit fee revenues of $8,831.70 per year after two years. The Forest Service would also be responsible for capping pipelines and removal of livestock developments, such as fences and water developments as planning, time, and funding permit. Some water developments may remain to support wildlife depending on needs and funding opportunities. Permittees who participated in the development of range improvements would be reimbursed for their amortized share, consistent with direction in FSH 2209.13, Chapter 70.

Since the costs of grazing administration are not completely offset by the grazing fees collected for any of the alternatives, long term costs to the Forest Service would go down under Alternative A. However, the Forest Service is not required to achieve a profit from the grazing program as discussed above. Alternative A would eliminate all benefits to permittees and would force the permittees to either find other locations for grazing or lose this source of income.

Alternatives B and C

Both Alternatives B and C maintain or improve resource conditions in rangeland health, vegetation, watershed conditions, designated Botanical Areas, and wildlife habitat relative to livestock grazing. Alternative B proposes to meet the desired condition without additional investments in new range improvements. Alternative C (Proposed Action) proposes new range improvements, in addition to utilizing existing structures, to better control, distribute, and in places, exclude livestock use and incorporates a suite of adaptive management options that could be employed, if needed. For both alternatives: 1) the permittee is responsible to move livestock before utilization standards for riparian and upland areas are exceeded; 2) there are monitoring requirements to ensure desired resource conditions are maintained or achieved; and 3) monitoring results could lead to a reduction in total livestock use on individual allotments if grazing capacity determinations, resource conditions, or both warrant reductions.

Alternative C includes new structural improvements and proposes alternative management activities intended to sustain livestock grazing in the eight allotments while improving range conditions. No permitted AUM reductions are proposed, although actual use could be reduced in order to meet required resource conditions. The additional structures may increase the administrative cost to manage these allotments, but would also provide limited employment opportunities. Under Alternative C, only the initial new improvements were included in the economic analysis. No adaptive management options were included. This is because in most

cases there is a range of adaptive options that could be chosen and there is no way of knowing which might be chosen in the future.

Both Alternatives B and C could result in a reduction in actual use (less days or livestock) for some allotments. This is totally dependent on the ability to meet Forest Plan resource requirements. Alternative B is the least costly of the two action alternatives, but it poses a higher risk to the permittee in terms of potential actual use reductions. Alternative C includes new structural improvements that better distribute livestock and reduce effects to riparian areas. Although it is more costly, it provides the best opportunity to maintain higher actual use on the allotments. Both Alternatives could be economically practicable for the affected ranches; however, the magnitude of effects depends upon a number of factors, including options available to each permittee, the size of their total operations, debt structure, and business goals and objectives. These factors are specific to each individual operation and only the permittees can choose which options fit their business needs.

Under both action alternatives, costs to the Forest Service are not reduced since administration and monitoring costs remain similar. Both costs and benefits for permittees could be reduced, if actual use is reduced. Many permittee costs are directly related to the actual use on the allotment, thus costs could be reduced more in Alternative B than C.

Prescribed fire is proposed as an adaptive option under Alternative C. Prescribed fire costs were not included in the economic analysis. Prescribed fire costs generally are $300 per acre.

Social Effects

For many people, livestock ranching is an essential and unique element of western culture. The ranching lifestyle has its roots deep in the history of the area and for many is a valued link to the area's rich history. Some families have raised cattle or sheep for generations making this lifestyle more than an element of the area's culture, but also a part of family identity. Changes in public grazing opportunities have the potential to affect the viability of marginal operations and are of great concern to those who value this lifestyle.

The effects of the alternatives on the social setting are directly tied to the economic effects. The loss of these ranching operations could force landowners to sell to developers and affect the social fabric of the communities. Alternative A is the most likely to result in changes in the social setting as a result of loss of grazing on the eight allotments being analyzed at this time. Those alternatives (Alternatives B and C) that have higher benefits to local ranchers and provide grazing are more likely to maintain cattle ranching in the local communities.

A direct social and economic effect of the three alternatives is the risk associated with livestock-vehicle collisions. This potential currently exists along the Sheridan Lake Road, Deerfield Road, Twin Springs Road, and the Old Hill City Highway. The Sheridan Lake Road is expected to be reconstructed within the next few years, and this would likely straighten out some curves, increase speed, and likely increase traffic. The Deerfield Road is also expected to see increased traffic after the planned surfacing of the South Rochford Road is completed. The risk of collision could potentially result in human or livestock injury or death. This has both social and economic impacts. Alternative A would eliminate grazing thereby eliminating the potential for collisions on the affected allotments. Alternative B does not include fencing to restrict livestock from entering the road right-

of-way; hence it would not reduce the risk of livestock-vehicle collisions. Alternative C reduces or eliminates the risk by requiring that these road right-of-ways be fenced off.

Cumulative Effects

There are many outside influences that affect the economic viability of ranching operations including livestock market conditions, weather patterns, governmental regulation, occurrence of diseases, and international trade policies. Within the local counties, the overall volume of livestock related jobs in the local economy is quite small. For this reason, despite the size of the differences between the alternatives, the economy-wide impacts of all the alternatives are small. However, the direct and indirect effects may be considerable for individual persons, families, or businesses within the analysis area. Within the rural communities of the surrounding area, particularly in very small communities, the loss of a single job may be very important to that community, even though it may be barely noticeable within the larger economy.

The American Farmland Trust (2006) found that from 1992 to 1997, more than 11 million acres of rural land in the United States were converted to developed use – more than half of that conversion was from agricultural land. In that same period, an average of more than 1 million agricultural acres was developed each year. The rate is increasing – up 51% from the rate reported in the previous decade. If these local ranching operations become economically unviable, it is likely that the ranches would be sold, broken up, and developed for residential properties or converted to other uses. Gradually the ranching component of the social setting could be decreased or lost.

The use and occupation of the Black Hills is increasing due to population growth and a fairly diverse and flexible economy. Subdivisions and home construction building permits on private lands within and adjacent to the project area have increased steadily and demands for public access roads and utility lines across the project area would continue to exert additional pressure on the Forest. Due to the increase in population, more users frequenting the Forest and subdivisions within and adjacent to the National Forest, livestock/private property controversies could rise.

Summary of Effects to Socio-economics

All of the grazing alternatives would provide some economic value to the local communities. The effects of the alternatives on the social setting are directly tied to the economic effects. Those alternatives that have a lower benefit to local permittees could affect the viability of those operations and move them toward economic demise. The loss of these ranching operations could force landowners to sell to developers and affect the social fabric of the communities. Those alternatives that have higher benefits to local ranchers and provide some added grazing are more likely to maintain cattle ranching in the local communities. All action alternatives would help with the attainment of Forest Plan Goal 8 and Forest Plan Objectives 803 and 804. Alternative A would not help attain these goals and objectives.

Environmental Justice

Executive Order 12898 (February 11, 1994) directs Federal agencies to focus attention on the human health and environmental conditions in minority communities and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

None of the communities in the project area contain low-income or minority populations as defined by Executive Order 12898. During the course of this analysis, no alternative resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency has considered all input from persons or groups regardless of age, race income status, or other social and economic characteristics.

Civil Rights
No civil rights effects associated with age, race, creed, color, national origin, or sex have been identified.

IRREVERSIBLE AND 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. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

No irreversible or irretrievable commitments of resources are expected as a result of implementation of any of the project alternatives. In areas of poor rangeland condition, short-term losses may occur until such sites have recovered their potential or desired conditions. However, such losses are not expected to occur for any substantial period of time and therefore are not irretrievable.

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).

All action alternatives would allow short-term uses (livestock grazing) that may promote long-term productivity and sustainability for rangeland resources in the project area. The No Action alternative would preclude those short-term uses but still promote long-term productivity and sustainability.

UNAVOIDABLE ADVERSE EFFECTS

Alternatives B and C would continue livestock grazing in the Mystic Range Project area. Livestock grazing can contribute to short and long term effects to soils, vegetation, and water quality (Waterhsed/Geology/Soils, Range, and Wildlife sections in Chapter 3).

CHAPTER 4 BIBLIOGRAPHY/REFERENCES

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CHAPTER 5 GLOSSARY

Access - The opportunity to approach, enter, and make use of public or private land.
Activity - A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain forest and rangeland outputs or achieve administrative or environmental quality objectives.
Adaptive Management - A type of natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves testing, monitoring, evaluating, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Results are used to modify management policy.
Adaptive Management (as defined in this EIS) - Adaptive management is defined as a process where land managers implement management practices that are designed to meet LRMP standards and guidelines, and would likely achieve the desired conditions in a timely manner. If monitoring shows that desired conditions, as described by LRMP Direction, are not being met, then an alternate set of management actions, the effects of which are analyzed in this EA, would be implemented to achieve the desired results.
Adjustment - Change in animal numbers, seasons of use, kinds or classes of animals, or management practices as warranted by specific conditions.
Administrative Use - Use authorized by Forest Service officials to complete management functions and activities.
Administrative Wetland - These sites are considered to be wetlands for administrative purposes. However, having been delineated based on remote sensing technology, these sites may not meet all criteria (hydrophytic vegetation, hydric soils, and wetland hydrology) to be considered jurisdictional wetlands.
Affected Environment - The biological and physical environment that may be changed by proposed actions and the relationship of people to that environment.
Allocation - The assignment of a land area to a particular use or uses to achieve management goals and objectives.
Allotment - A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands, including national grasslands.
Allotment Management Plan (AMP) - The document containing the action program needed to manage the range resource for livestock utilization, and possibly wildlife utilization, while considering the soil, watershed, wildlife, recreation, timber, and other resources in a range allotment. The document summarizes the record of decision affecting a particular allotment.
Allowable Use – 1) The degree of utilization considered desirable and attainable on various parts of a ranch or allotment considering the present nature and condition of the resource, management objectives, and levels of management. 2) The amount of forage planned to be used to accelerate range improvement.
Alternative - A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision-making. An alternative need not substitute for another in all respects.
Animal Unit Month (AUM) - The amount of feed or forage required by an animal-unit for one month.
Animal-Month - A month's tenure upon the rangeland by one animal. Must specify kind and class of animal. Note: This term is not synonymous with animal unit month (AUM).
Animal-Unit - Considered to be a mature 1,000-pound cow, either dry or with a calf less than six months old, based on an average daily forage consumption of 26 pounds dry matter per day.
Annual (plant) - A plant that completes its life cycle and dies in one year or less.
Annual Operating Instructions (AOI) – These instructions specify those annual actions that are needed to implement the management direction set forth in the project-level NEPA decision. Actions in the AOI must be within the scope of the project level decision, and as such are not required to undergo any additional site-specific environmental analysis.
Aquatic Ecosystem - An ecosystem (biological and physical components and their interactions) in which water is the principal medium. Examples include wetlands, streams, reservoirs, and areas with plants or animals suited to either permanently or seasonally inundated soils.
Archeological Resource - Any physical remains of past human life or activities.
Available Forage - That portion of the forage production that is accessible for use by a specified kind or class of grazing animal.
Available Lands - Those portions of the national forest or national grassland not administratively excluded from timber harvest or livestock grazing.
Base Property - Those lands in a ranching enterprise that are owned and required to hold a term grazing permit.

Benchmarks – Benchmarks are reference points that are sensitive to management changes. These are the small areas where *long-term* trend studies are installed and maintained so that the manager can assess the resource impacts from management.
Best Available Science – "Best Available Science" was considered in analysis for the range management resources by reviewing information from the following sources: 1) Black Hills National Forest Monitoring Reports; 2) Phase II Final EIS, applicable supporting documents, and applicable literature references; 3) applicable research in cited works which represents a reasonable cross-section of the total range available, including responsible opposing views, sufficient to professionally evaluate the effects of this proposal; 4) applicable Forest-wide species assessments; 5) applicable Regional species assessments; and 6) literature sources offered in comments provided on this project analysis.
Best Management Practices (BMPs) - Land management methods, measures or practices intended to minimize or reduce water pollution as well as practices that result in healthy ecosystems. Usually, BMPs are applied as a system of practices rather than a single practice. BMPs are selected based on site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.
Biennial (plant) - A plant that lives for two years, usually flowering and fruiting only in the second year and then dying.
Big Game - Certain wildlife that may be hunted for sport under state laws and regulations, including elk, mule and white-tail deer, turkey, and bighorn sheep.
Biological Diversity - The full variety of life in an area, including the ecosystems, plant and animal communities, species and genes, and the processes through which individual organisms interact with one another and their environments. Emphasis is on the diversity of native or endemic species.
Botanical Area - A unit of land that contains plant specimens, plant groups, or plant communities that are significant because of their form, color, occurrence, habitat, location, life history, arrangement, ecology, rarity, or other features.
Browse - Twigs, leaves, and young shoots of trees and shrubs upon which animals feed: in particular, those shrubs that are utilized by some livestock and big game animals for food.
Brush barriers – Piles of logging slash, brush, stumps or other natural woody material that has been placed on the ground around sensitive sites (e.g. archeological sites) to exclude livestock.
Candidate Species – Species for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list the species for protection under the Endangered Species Act.
Capable Rangeland - The potential of an area of land to produce resources, supply goods and services and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices such as silviculture or protection from fire, insects, and disease.
Carrying Capacity - The maximum possible stocking rate that is consistent with maintaining or improving vegetation or related resources. It may vary from year to year in the same area due to fluctuating forage production. Also called grazing capacity.
Carrying Capacity (Wildlife and Livestock Grazing) - The maximum number of animals that can be supported in a given environment without deteriorating that environment.
Cattleguard - A device or structure, at points where roads or railroads cross a fence line, that is so designed that vehicular travel is uninterrupted but crossing by all kinds of livestock is restricted.
CFR - Code of Federal Regulations.
Class of Animal - Description of age and/or sex-group for a particular kind of animal. Example: cow, calf, yearling, ewe, doe, fawn, etc.
Cold-water Fishery - Steam and lake waters that support predominately cold-water species of game or food fishes, which have maximum, sustained water-temperature tolerances of about 70 degrees Fahrenheit in the summer.
Community (Biological) - Any assembly of organisms living together.
Community (Social) - The people who reside in one locality and are subject to the same laws or who have common interests, etc.
Community Dynamics – A term used in Holistic Management to describe the relationship between organisms in an ecosystem.
Community Stability - The capacity of community to absorb and cope with change without major hardship to institutions or groups within the community.
Community Type – An aggregation of all plant communities with similar structure and floristic composition. A unit of vegetation within a classification with no particular successional status inferred. A taxonomic unit of vegetation classification referencing existing vegetation.

Conservation - The aggregate of practices and customs to perpetuate sustained yield of renewable resources and prevent waste of nonrenewable resources.
Conservation Practices - Required land use practices on the national grasslands that are imposed upon the persons or organizations holding grazing permits (including grazing agreements) in order to protect, improve, develop, and administer the land and thus assist in furthering the program of land conservation and good land utilization.
Consumptive Uses - Uses of a resource that reduce the supply. Examples include irrigation, domestic and industrial water use, grazing, and timber harvest.
Continuous Grazing - The grazing of a specific unit by livestock throughout a year.
Cool-Season Plant - A plant that generally makes the major portion of its growth during the late fall, winter, and early spring. Cool-season species generally exhibit the C3 photosynthetic pathway.
Cost - The negative or adverse effects or expenditures resulting from an action. Costs may be monetary, social, physical, or environmental in nature.
Cost Efficiency - The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specific levels in the least-cost manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates of return may be appropriate.
Council on Environmental Quality (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969.
Cover Type - The vegetative species that dominates a site. Cover types are named for one plant species or non-vegetative condition presently (not potentially) dominant, using canopy or foliage cover as the measure of dominance. In several cases, sites with more than one dominant species have been lumped together into one cover type. Co-dominance is not necessarily implied.
Cover/Forage Ratio - The ratio of tree cover (usually conifer types) to foraging areas, such as natural openings.
Cross Fence - A fence that divides an allotment or pasture into smaller units.
Cultural Resources - See Heritage Resources.
Cumulative Impact - The impact on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of the source (federal or nonfederal agencies, individuals). Cumulative effects can result from individually minor but collectively significant actions taking place over time.
Deciduous (Plant) - Plant parts, particularly leaves, that are shed at regular intervals or at a given stage of development; that is, a deciduous plant regularly loses or sheds its leaves.
Decision Documents - Documents that provide the criteria and information used in the formulation and evaluation of alternatives and the preferred alternative.
Decreaser (Plant) - Plant species of the original or climax vegetation that will decrease in relative amount with continued disturbance (heavy defoliation, fire, and drought) to the norm. Some agencies use this only in relation to response to overgrazing.
Deferment - Delay of livestock grazing on an area for an adequate time to allow plant reproduction, establishment of new plants, or restoration of vigor of existing plants.
Deferred Rotation - To discontinue grazing on various parts of a range in succeeding years, allowing each part of the range to rest successively during the growing season to permit seed production, establishment of seedlings, or restoration of plant vigor. Each rested part of the range is grazed during the year. At least two, but usually three or more, separate grazing units are required.
Defoliation - The removal of plant leaves by grazing or browsing, cutting, chemical defoliant, or natural phenomena, such as hail, fire, or frost.
Demand - The amount of output that users are willing to take at a specified price, time period, and conditions of sale.
Dependent Communities - Communities whose social, economic, or political life would become discernibly different in important respects if market or no market outputs from the national forest or national grasslands were significantly disrupted.
Desired Condition - A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved.
Desired Plant Community - A plant community that produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the land use plan/activity plan objectives established for an ecological site. The desired plant community must be consistent with the site's capability to produce the desired vegetation through management, land treatment, or a combination of the two.
Desired Plant Species - Species that contribute positively to the management objectives.

Deteriorated Range - Range where vegetation and soils have significantly departed from the natural potential. Corrective management measures, such as seeding, would change the designation from deteriorated range to some other term.
Developed Recreation - This type of recreation is dependent on facilities provided to enhance recreational opportunities in concentrated use areas. Examples include campgrounds and picnic areas. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water and buildings.
Developed Recreation Sites - Relatively small, distinctly defined areas where facilities are provided for concentrated public use, such as campgrounds, picnic areas, and swimming beaches.
Direct Effects - Environmental effects caused by an action and that occur at the same time and place.
Dispersal - Leaving an area of birth, origin, or activity for another area.
Dispersed Recreation - This type of recreational use requires few, if any, improvements and may occur over a wide area. This type of recreation involves activities related to roads, trails and undeveloped waterways, and beaches. The activities do not necessarily take place on or adjacent to a road, trail, or waterway, only in conjunction with them. Activities are often day-use oriented and include hunting, fishing, boating, off-road vehicle use, hiking, and others.
District Ranger - The official responsible for administering the National Forest System lands, including national grasslands, on a ranger district.
Disturbance - A discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.
Diversity - Diversity refers to the distribution and abundance of different plant and animal communities and species within the area covered by land and resource management plans. This term is derived from the National Forest Management Act (NFMA). This term is not synonymous with biological diversity.
Domestic - Refers to those animals and plants that are under the control of humans throughout their life cycle. Animals whose breeding is controlled by humans.
Drift Fence - An open-ended fence used to retard or alter the natural movement of livestock. Generally used in connection with natural barriers.
Drought – Any year or sequence of years when annual precipitation amounts are less than 75% below average.
Dry Meadow - A meadow dominated by grasses and characterized by soils that become moderately dry by mid-summer.
Ecological Diversity - The variety of ecosystems occurring within a given landscape.
Economic Efficiency - The usefulness of inputs (costs) to produce outputs (benefits) and effects when all costs and benefits that can be identified and valued are included in the computations. Economic efficiency is usually measured using present net value, though use of benefit-cost ratios and rates-of-return may sometimes be appropriate.
Ecosystem – 1) A community of living plants and animals interacting with each other and with their physical environment. A geographic area where it is meaningful to address the interrelationships with human social systems, sources of energy, and the ecological processes that shape change over time. 2) A community of organisms and its environment functioning as an ecological unit in nature.
Ecosystem Health - A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.
Ecosystem Management - Scientifically based land and resource management that integrates ecological capabilities with social values and economic relationships to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long term.
Effects - Physical, biological, social, and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect, and cumulative.
Effects (Heritage Resources) - Impacts to the characteristics that qualify a heritage resource for the National Register of Historic Places. These can include alterations in location, setting, use design, materials, feeling, and association. Adverse effects include:
Physical destruction or damage.
Isolation from or alteration of setting.
Introduction of visual, audible, or atmospheric elements.
Physical deterioration from neglect or from any action.
Transfer, lease, or sale.
Effectiveness Monitoring – This monitoring asks the question: "Did the management practices do what we wanted them to do; did they meet the objective?" An example is trend studies to determine whether vegetation is moving towards the desired plant community. It is long-term monitoring. It determines whether management practices are effective in moving the allotment towards desired condition as described in the Forest Plan and subsequent AMP.

Eligible (Heritage Resources) - Indicates that a specific heritage resource qualifies for or is already listed in the National Register of Historic Places.
Endemic – Plants or animals that occur naturally in an area and whose distribution is relatively limited to a particular locality.
Energy Flow - A term used in Holistic Management which describes: the movement of energy from the sun, the ability of green plants to capture that energy, and the subsequent conversion to a form they can use. HM is concerned with management decisions made that may affect how much solar energy is captured by plants and put to use. Energy flow is a function of the total area of leaves actively converting sunlight into forage, the length of time this conversion goes on, the efficiency of the conversion, and what happened to the forage after it is grown. High energy flow is characterized by an abundance of broad leafed plants; close plant spacing; rapid growth unimpeded by poor aeration, compaction, or other soil problems, and plants active through the longest possible growing period (both warm- and cool-season plants). Low energy flow is characterized by waxy or narrow leafed plants with slow growth rates; gray, oxidizing grasses; wide plant spacing, and slow plant growth due to capping, compaction, waterlogging, or other soil problems.
Environment - All the conditions, circumstances, and influences surrounding and affecting the development of an organism or group of organisms.
Environmental Analysis - An analysis of alternative actions and their predictable short- and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions.
Environmental Impact Statement - A public document, for which a federal agency is responsible, that serves to disclose the effects of a federal action, and alternatives, on the human environment. It is used by federal officials to plan actions and make decisions.
Erosion - The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.
Executive Order - An order or regulation issued by the President or some administrative authority under presidential direction.
Exotic - Not native to the place where it is found. Often in reference to a specific race or variety of an organism that has been transplanted to a new region.
Exotic Species - An organism that exists in a free state in an area in which it is not native. Also refers to animals from outside the country in which they are held captive or in free-ranging populations.
Extinction - Disappearance of a taxon of organisms from existence in all regions.
Extirpated - The elimination of a species from a particular area.
Fair Market Value - The amount or value for which, in all probability, a property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desires but is not obligated to buy.
Fauna – All vertebrate and invertebrate animal species.
Fertilizer - Mineral nutrients added to the substrate of plants to enhance growth and vitality.
Fire Suppression - All the work and activities connected with fire-extinguishing operations beginning with discovery and continuing until the fire is completely extinguished.
Fire-dependent Systems - Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.
Floodplain - The area adjacent to a stream/river channel effective in carrying flow, within which carrying capacity must be preserved and where the flood hazard is generally highest; that is, where flood depths and velocities are the greatest (FSH 2520).
Flora – All plant species.
Forage - Vegetation used for food by wildlife and livestock, particularly ungulate wildlife and domestic livestock.
Forage Production - The weight of forage that is produced within a designated period of time on a given area. The weight may be expressed as green, air dry, or oven dry. The term may also be modified as to time of production such as annual, current year, or seasonal forage production.
Forage Reserve – Standing forage specifically maintained for future or emergency use.
Forbs - Any herbaceous plant other than those in the grass, sedge, and rush families. For example, any non grass-like plant that has little or no woody material.
Forest Development Roads - A Forest road under the jurisdiction of the Forest Service. Forest Development Roads are not intended to meet the transportation needs of the public at large. Generally, these are roads constructed to a standard to serve expected traffic generated by resource management. Although generally open and available for public use, the Forest Service may restrict or control use to meet specific management direction.
Forest Development Trails - As defined in 36 CFR 212.1 and 261.2, those trails wholly or partly within or adjacent to and serving national forests and national grasslands that have been included in the Forest Development Transportation Plan. A trail is a pathway for purposes of travel by foot, stock, or trail vehicle.

Forest Plan (Forest Land and Resource Management Plan) - A document that guides natural resource management and establishes standards and guidelines for a national forest or national grassland. Required by the National Forest Management Act.
Forest Supervisor - Official responsible for administering any particular national forest. Forest supervisors report to regional foresters.
Forest System Roads - Roads that are part of the Forest Development Transportation System, which includes all existing and planned roads, as well as other special and terminal facilities designated as part of the Forest Development Transportation System.
Forested Range - Forestland that produces, at least periodically, sufficient under story vegetation suitable for forage and that can be grazed without significantly impairing wood production and other forest values.
Fragmentation - The breakup of a large land area (such as a grassland) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.
FSH - Forest Service Handbook
FSM - Forest Service Manual
Fuel Break - A zone in which fuel quantity has been reduced or altered to provide a position for wildfire suppression. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, and human-made barriers.
Fuel Treatment - Any manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control, including lopping, chipping, crushing, piling, and burning. Synonymous with fuel modification.
Fuels - The organic materials that will support the start and spread of a fire: duff, litter, grass, weeds, forbs, brush, trees, and dead woody materials.
Geographic Information System (GIS) - A spatial type of information management system that provides for the entry, storage, manipulation, retrieval, and display of spatially oriented data.
Greenline Vegetation: The Greenline is the first perennial vegetation that forms a lineal grouping of community types on or near the water's edge. Most often occurs at or slightly below bankfull stage (Winward 2000). It is found only along streams with defined channels.
Goal - A concise statement that describes a desired condition to be achieved sometime in the future. A goal is normally expressed in broad, general terms that are timeless in that there is no specific date by which the goal is to be achieved (36 CFR 219.3). The Region 2 Desk Guide has this to say about goals: "Desired conditions and processes are measurable, have a timeless nature, and describe a resource condition or ecological process. In the first round of (land and resource management) planning, these statements were often termed 'goals.' They describe the conditions or processes we expect to achieve through resource management. Complete accomplishment of desired conditions is not mandatory during the current planning phase, but it is our ultimate intent."
Graminoid - Grass or grass-like plant, such as *Poa*, *Carex*, or *Juncus* species
Grass - A member of the grass family, Poaceae.
Grassland - Any land on which the dominant plants are grasses or on which grasses originally dominated.
Grazing - The act of animals consuming plants on range or pasture.
Grazing Capacity – The amount of livestock use that can be allowed while meeting basic resource needs and associated allotment objectives. The rate of stocking allows resource conditions to meet or be moving towards Forest Plan goals and objectives.
Grazing Distribution - Dispersion of livestock or wild herbivores grazing within a given area.
Grazing Fee - A charge, usually on a monthly basis, for grazing use by a given kind of animal.
Grazing Land - An area of rangeland, public or private, that is used by animals for grazing.
Grazing Permit - Official, written permission to graze a specified number, kind, and class of livestock for a specific period on a defined range allotment.
Grazing Season – 1) A period of grazing to obtain optimum use of the forage resource. 2) On public lands, an established period for which grazing permits are issued.
Grazing System - A specialization of grazing management that defines systematically recurring periods of grazing and deferment for two or more pastures or management units. Some examples are: deferred grazing, rotation grazing, deferred-rotation grazing, and short-duration grazing.
Grazing Trespass - The grazing of livestock on a range area without proper authority and resulting from a willful or negligent act.
Grazing Unit - An area of rangeland, public or private, that is grazed as an allotment or pasture.
Grazing, Short-duration - A grazing system in which animals are concentrated on less than one-half of the total land area and the lengths of deferment exceed the lengths of grazing.

Ground Cover - The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, cobble, gravel, stones, and bedrock. Ground cover plus bare ground would total 100 percent.
Groundwater - Water within the Earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled. The upper surface level forms the water table.
Growing Season - In temperate climates, that portion of the year when temperature and moisture permit plant growth.
Guideline - Advisable actions that should be followed to achieve grassland or forest goals and objectives. Deviations from guidelines must be analyzed during project-level analysis and be documented in a project decision document but do not require management plan amendments.
Habitat – The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.
Habitat Capability – The capacity of a vegetative community to support selected wildlife and fish species for all or a part of its life cycle. Habitat capacity is normally expressed as projected populations or densities of animals.
Habitat Effectiveness - As used in this document, habitat effectiveness refers to the capability of an area to support big game based on forage, cover, open roads, and the spatial distribution of the three factors, regardless of the time of year.
Habitat Suitability – A measure of current habitat quality relative to the local biological potential of an area to provide habitat for a species. Habitat suitability is usually expressed as low, moderate or high or is quantitatively presented as an index value scaled from 0 (unsuitable) to 1.0 (optimum habitat).
Hardened Sites (Recreation) - Developed recreation sites where techniques have been used to protect natural resources (soil, water, vegetation, etc.) from overuse. For example, vehicles may be confined to roads by barriers or gravel, pavement, or soil additives may be placed on roads, walkways, and under picnic tables.
Hardened Water Crossings – Livestock watering sites where techniques have been used to protect stream banks and stream beds from sloughing and erosion. For example, livestock may be confined to one short section of a stream where rock, gravel, or concrete has been placed on the banks of the stream.
Herb - A plant with one or more stems that dies back to the ground each year.
Herbicide - A chemical substance used for killing plants.
Herbivore - An animal that subsists principally or entirely on plants or plant material.
Herd - An assemblage of animals usually of the same species.
Heritage Resources - The physical remains and conceptual content or context of an area. Physical remains may include artifacts, structures, landscape modifications, rock art, trails, or roads. Conceptual content/context includes the setting for legendary, historic, or prehistoric events, such as a sacred area for American Indians.
Historic Property - Any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register. This term includes artifacts, records, and remains related to and located within such properties.
Home Range - The geographic area within which an animal restricts its activities.
Human Environment - Includes the natural and physical environment and the relationship of people within that environment.
Hydrologic Cycle - The ecological cycle that moves water from the air, by precipitation, to the earth and back to the atmosphere. A variety of processes are involved, including evaporation, runoff, infiltration, percolation, storage, and transpiration.
IDT - Interdisciplinary Team . See Interdisciplinary Team (ID Team).
Implementation - Those activities necessary to initiate the actions in the approved land and resource management plan.
Implementation Monitoring – This type asks the question: "Did we do what we said we were going to do?" It includes allotment inspections and utilization estimates. It is considered short-term monitoring. It determines whether standards, guidelines, and management practices are implemented as detailed in the Forest Plan and subsequently AMP.
Inaccessible Range – Rangeland that is not grazed by livestock because of barriers, distance to water or steep slopes.
Increaser (Plant) - Plant species of the original vegetation that increase in relative amount, at least for a time, under continued disturbance (heavy defoliation, fire, drought) to the norm.
Indigenous Species - Animals or plants that originated in the area in which they are found; for example, animals or plants that were not introduced after frontier settlement of the Northern Great Plains and that naturally occur on the Northern Great Plains.
Indirect Effects - Environmental effects caused by an action but resulting later in time or farther away in place, yet which are still reasonably foreseeable.
Infrastructure - The facilities, utilities, and transportation systems needed to meet public and administrative needs.
In-holdings - Lands within the proclaimed boundaries of a national forest or national grassland that are owned by some other agency, organization, or individual.

Insecticide - A chemical or biological agent formulated to kill insects.
Instream Flows - The minimum water volume (cubic feet per second) in each stream necessary to meet seasonal stream flow requirements for maintaining aquatic ecosystems, visual quality, recreational opportunities, and other uses.
Integrated Pest Management (IPM) – A process for evaluating and selecting a program from available techniques to reduce pest populations in an ecologically, economically, and socially acceptable manner. Programs may include one or a combination of available techniques that may include the use of pesticides, cultural, or silvicultural treatments; biological control agents; host resistance; genetic control; mechanical destruction or trapping; and behavioral chemicals including attractants and repellants. For this project, IPM considers four broad categories of techniques to treat noxious weeds: biological, cultural, mechanical, and chemical approaches.
Intensity (Fire Management) - A measure (in BTUs per foot per second) of the energy released per unit of time in an area of actively burning fire; the amount of heat released per foot of fire front per second.
Intensive Grazing Management – Grazing management that attempts to increase production or utilization per unit area or production per animal through a relative increase in stocking rates, forage utilization, labor, resources, or capital. Intensive grazing management is not synonymous with rotation grazing. Grazing management can be intensified by using any one or more of a number of grazing methods that use relatively more labor or capital resources.
Interdisciplinary Team (ID Team) - A group of people with different specialized training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem.
Intermittent Stream – 1) A stream that flows only 50 to 90 percent of the year when it receives water from some surface source, such as melting snow. 2) A stream that does not flow continuously, as when water losses from evaporation or seepage exceed the available stream flow.
Introduced Species - A species not a part of the original fauna or flora of the area in question.
Invader (Plant) - Plant species that were absent in undisturbed portions of the original vegetation of a specific range site and will invade or increase following disturbance or continued heavy grazing.
Invasive Plant - A species that displays rapid growth and spread, free from natural controls and enhanced by abundant seed production and germination.
Irretrievable Commitments - Applies to losses of production or use of renewable natural resources for a period of time. For example, road construction leads to an irretrievable loss of the productivity of the land under which the road is located. If the road is later obliterated, the land may eventually become productive again. The production lost is irretrievable, but the action is not irreversible.
Irreversible Commitments - Decisions causing changes that cannot be reversed. For example, if an area is mined, that area cannot, at a later date, be allocated to some other resource activities, such as Wilderness. Once mined, the ability of that area to meet Wilderness criteria, for instance, has been irreversibly lost. Irreversible commitments often apply to some non-renewable resource, such as minerals and heritage resources.
Key Area - 1) An area selected to monitor the effects of management activities on ecosystem health. Examples may include, but are not limited to, uplands, riparian areas, and valley bottoms. 2) That portion of a pasture or grazing unit which is selected as a monitoring point because of its location, use, or grazing value.
Land Exchange - The conveyance of nonfederal land or interests to the United States in exchange for National Forest System land, including national grasslands, or interests in such land.
Land Unit - A mapped land type polygon or a mapped soil unit.
Landowner - Person who has title to land recognized by the prevailing legal system.
Landscape - The landforms of a region in aggregate.
Listed Species - Any species of fish, wildlife, or plant officially designated as endangered or threatened by the Secretary of the Interior or Commerce.
Litter - A surface layer of loose organic debris consisting of freshly fallen or slightly decomposed organic materials.
Livestock - Domestic animals.
Livestock Use Permit - Used to document specific animal numbers, class, and seasons of use under a specified management plan for a given period (10 years).
Logging - Harvest of trees of given size from a forest.
Management - The organization of actions designed to reach a given set of objectives.
Management Area – Area of the grassland that are managed for a particular emphasis. These areas have common management direction and may be non contiguous on the national forest or national grassland.
Management Indicator Species – A plant or animal species selected because their status is believed to (1) be indicative of the status of a larger functional group of species, (2) be reflective of the status of a key habitat type, or (3)

act as an early warning of an anticipated stressor to ecological integrity. The key characteristic of a MIS species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs.
Management Indicators (Fish and Wildlife) - Plant or animal species or habitat components selected in a planning process used to monitor the effects of planned management activities on populations of wildlife and fish, including those that are socially or economically important.
Marginal Land - Land of questionable physical or economic capabilities for sustaining a specific use.
Market Value - The unit price of an output normally exchanged in a market after at least one stage of production, expressed in terms of what people are willing to pay as evidenced by market transactions.
Meadow – 1) An area of perennial herbaceous vegetation, usually grass or glasslike, used primarily for hay production. 2) Openings in forests and grasslands of exceptional productivity in arid regions, usually resulting from high water content of the soil (streamside situations, areas having a perched water table).
Memorandum of Understanding (MOU) - A legal agreement between the Forest Service, other agencies, private parties, or individuals resulting from consultation between them that states specific measures they will follow to accomplish a project. A memorandum of understanding is not a fund-obligating document.
Migration - The movement of genotypes (as individuals) into or out of a population.
Mineral Cycle – Term used in Holistic Management to describe the cycle of mineral nutrients from soil to above-ground plants and animals and back to the soil again. A healthy and productive environment will promote the movement of minerals from deep soil layers to above-ground plants with a minimum of mineral loss from soil erosion or mineral leaching.
Mitigate - To lessen the severity.
Mitigation - Includes avoiding an impact by not taking certain actions; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources or environments.
Mitigation (Heritage Resources) - Actions taken to reduce or eliminate adverse effects caused to heritage resources. Avoidance is not considered a mitigation measure.
Monitoring and Evaluation - The sample collection and analysis of information regarding LRMP management practices to determine how well objectives have been met, as well as the effects of those management practices on the land and environment. There are three types of monitoring – see Implementation, Effectiveness, and Validation Monitoring.
Monoculture - The cultivation of a single crop to the exclusion of other land uses.
Motorized Recreation - A recreational opportunity provided through the use of a motorized vehicle. This includes travel on and off highways, Forest roads, and four-wheel-drive primitive roads and trails. Travel regulations may be established to protect forest and grassland resources, to minimize use conflicts, and to promote user safety.
MOU - See Memorandum of Understanding.
Multiple Use - According to the Multiple Use Sustained Yield Act of 1960, multiple use is the management of all the various renewable surface resources of the National Forest System, including national grasslands, so that they are utilized in the combination that will best meet the needs of the American people. Such management makes the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. Some lands will be used for less than all of the resources. Harmonious and coordinated management of the various resources is employed, each with the other, without impairment of the productivity of the land. Consideration is given to the relative values of the various resources and not necessarily the combination of uses that gives the greatest dollar return or the greatest unit output.
National Environmental Policy Act of 1969 (NEPA) - An act declaring a national policy to encourage productive harmony between people and their environment, to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of people and to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality.
National Forest Management Act (NFMA) - A 1976 law that amended the Forest and Rangeland Renewable Resources Planning Act and requires the preparation of Regional and Forest Plans and regulations to guide forest plan development.
National Forest System (NFS) Lands - Federal lands designated by Executive Order or statute as national forests, national grasslands, or purchase units, or other lands under the administration of the U.S. Forest Service.
National Register of Historic Places (NRHP) - A list of heritage resources that have local, state, or national significance maintained by the Secretary of the Interior.

National Wilderness Preservation System - All lands covered by the Wilderness Act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.
Native - A plant or animal indigenous to a particular locality.
Native Seed - Seeds of plants considered indigenous to the Northern Great Plains.
Natural - Occurring in conformity with the ordinary course of nature. An area having undergone no, or at least minimal, disturbance by anthropogenic forces.
Natural Barrier - A natural feature that will restrict livestock movements, such as a dense stand of trees or downfall, or a feature that will stop the spread of fire, such as a talus slope, water course, or areas otherwise devoid of fuel.
NEPA Process - Means all measures necessary for compliance with the requirements of Section 2 and Title I of NEPA.
Niche - The ecological role of a species in a community.
No Adverse Effect (Heritage Resources) - Any effect on a heritage resource that would not be considered harmful to those characteristics that qualify the property for inclusion in the National Register of Historic Places.
No Effect (Heritage Resources) - No effect to those characteristics that qualify the property for inclusion in the National Register of Historic Places.
No Action Alternative - An alternative that maintains established trends or management direction.
Non-consumptive Use - Those resources that do not reduce the supply. No consumptive uses of water include hydroelectric power generation, boating, swimming, etc.
Nonmotorized Activities - Activities that do not incorporate the use of a motor, engine, or other nonliving power source. This includes such machines as aircraft, hovercraft, motorboats, automobiles, motor bikes, snowmobiles, bulldozers, chainsaws, rock drills, and generators.
Non-point Source Pollution - Pollution whose source is not specific in location. The sources of the pollutant discharge are dispersed, not well-defined or constant. Examples include sediments from logging activities and runoff from agricultural chemicals.
Noxious Weeds - Those plant species designated as weeds by federal or state laws. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host for serious insects or diseases, and generally non-native.
Objective - A concise, time-specific statement of measurable, planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and resources to be used in achieving identified goals.
Off-Highway Vehicle (OHV) or Off-Road Vehicle (ORV) - Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, marsh, swampland, or other natural terrain.
Operating Plan - A written plan, approved by a forest officer and prepared by those engaged in mining activity on the national forest or national grassland. It covers prospecting, exploration, or extraction activities that will take place on National Forest System lands, including national grasslands.
Opportunity Cost - A foregone value. In this analysis, it is a cost calculated as the difference between present net value of the alternative and the present net value (PNV) of the maximum PNV increment.
Outputs - The goods, end products, or services purchased, consumed, or utilized directly by people. Outputs are goods, services, products, and concerns produced by activities that are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. A broad term used to describe any result, product, or service that a process or activity actually produces.
Overgrazing - Continued heavy grazing that exceeds the recovery capacity of the community and creates a deteriorated range.
Overstocking - Placing a number of animals on a given area that will result in overuse if continued to the end of the planned grazing period.
Overstory - The portion of vegetation in a forest that forms the uppermost foliage layer.
Parturition Habitat - Habitat used by big game species during the birthing season.
Pasture - A land area consisting of grass or other growing plants used as food by grazing animals. Also an area used for grazing, often enclosed and separated from other areas by fences, hedges, ditches, or walls.
Perennial (plant) - A plant that lives for two or more years.
Perennial Streams - Streams that flow continuously throughout most years.
Permitted Grazing - Use of a National Forest System range allotment under the terms of a grazing permit.
Permittee (Grazing) - One who holds a permit to graze livestock on state, federal, or certain privately owned lands.
Pesticide - A chemical agent formulated to kill or suppress insects, plants, or animals.
Pioneer Species - The first species or community to colonize or re-colonize a barren or disturbed area in primary or secondary succession.

Planned Grazing – A term associated with Holistic Management (HM)where a plan for pasture use is developed, progress is monitored continuously, deviations are controlled as soon as possible, and replan efforts are made whenever necessary. Practitioners of HM consider terms such as rotational grazing or short duration grazing as subject to inflexible time schedules, which they perceive may lead to overgrazing of plant regrowth. The planning of livestock grazing simultaneously covers many variables: animal behavior, breeding, performance, wildlife needs, other land uses, weather, plant growth rates, poisonous plants, dormant periods, droughts, and so forth. The purpose of such planning is to use livestock to bring about the future landscape described by the holistic goal.
Planning Area - The area of the National Forest System, including national grasslands, covered by a Regional or Forest Plan.
Planning Period - A time interval for which inputs and outputs are identified in a planning process. Current RPA and National Forest Plan intervals are five and ten years, respectively.
Planning Questions - A major policy question of long-range significance, derived from the public issues and management concerns, to be addressed when selecting among alternative Forest plans.
Planning Records - Documents and files that contain detailed information and decisions made in developing the Forest Plan. Available at the Forest Supervisor's Office.
Planning Unit – Each individual national grassland and forest in the planning area.
Plant Associations - A grouping of plants that have reached dynamic equilibrium with the local environmental conditions; equivalent to climax. On site, there is no evidence of replacement by other dominant plant species, and there is no evidence of serious disturbances.
Plant Communities - Assemblages of plant species living in an area. A plant community is an organized unit to the extent that it has characteristics in addition to the individuals and populations and functions as a unit.
Potential Natural Community (PNC) - A taxonomic unit of vegetation classification. The biotic community that would be established under present environmental conditions if all successional sequences were completed without additional human-caused disturbances. Natural disturbances, such as drought, flood, wildfire, grazing by native fauna, and insect and disease infestations, are inherent in the development of potential natural communities, which may include naturalized, non-native species.
Preferred Alternative - The alternative recommended for implementation in the Forest Plan based on the evaluation completed in the planning process.
Prehistoric Site - Archeology sites associated with American Indians and usually occurring before contact with Europeans.
Prescribed Burning - Controlled application of fire to wild land fuels in either their natural or modified state, under specified environmental conditions, that allows the fire to be confined to a predetermined area and, at the same time, to produce the fire line intensity and rate of spread required to attain planned resource management objectives.
Prescribed Fire - A fire burning with prescription, resulting from planned or unplanned ignition.
Present Net Value (PNV) - The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.
Primary Grazing Areas - Areas that animals prefer to use and over which they will graze when management is limited. The area on which overuse will occur before secondary range is used when animals are allowed to shift for themselves.
Productivity - The total quantity of organic material produced within a given period by organisms or the energy that this represents, such as gram-calories per square centimeter per year. The innate capacity of an environment to produce plant and animal life. The capacity of a soil to produce a certain kind of crop under a defined set of management conditions.
Proper Functioning Condition (PFC) - Riparian/wetland areas achieve proper functioning condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This reduces erosion; improves water quality; filters sediment; captures bed load; aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize stream banks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian/wetland areas is a result of the interaction among geology, soil, water, and vegetation.
Proposed Action - In terms of the National Environmental Policy Act, the project, activity, or action that a federal agency intends to implement or undertake and which is the subject of an environmental analysis.
Proposed Species - Any species of fish, wildlife, or plant that is proposed by the Fish and Wildlife Service or the National Marine Fisheries Service for listing as threatened or endangered.
Public - The people of an area, state, or nation that can be grouped together by a commonality of interests, values, beliefs, or life-style.

Public Access - Usually refers to a road or trail route over which a public agency has secured a right-of-way for public use.
Public Involvement - A Forest Service process designed to broaden the information base upon which agency decisions are made. It includes the following steps: Informing the public of Forest Service activities, plans, and decisions. Encouraging public understanding about the participation in the planning processes that lead to final decision-making.
Public Issue - A subject or question of widespread public interest identified through public participation relating to management of National Forest System lands, including national grasslands.
Quality Habitat – Habitat that is highly suitable for a plant or animal species or community based on the local biological site potential.
Range - Any land supporting vegetation suitable for grazing including rangeland, grazeable woodland, and shrubland.
Range Allotment - A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands, including national grasslands, and other associated lands administered by the Forest Service.
Range Analysis - Systematic acquisition and evaluation of rangeland resources data needed for allotment management planning and overall land management.
Range Betterment Funds - Funds established by Title IV, section 401 (b) (1), of the Federal Land Policy and Management Act of 1976 to be used for range improvement. This consists of 50 percent of all money received by the United States as fees for grazing livestock on the national forest and national grasslands in the 16 contiguous western states.
Range Condition – 1) A rangeland is considered to be in satisfactory condition when the desired condition is being met or short-term vegetative objectives are being achieved to move the rangeland toward the desired condition or trend. Unsatisfactory condition is when the desired condition is not being met and short-term vegetative objectives are not being achieved to move the rangeland toward the desired condition or trend. 2) Historically, range condition usually has been defined in one of two ways: (a) a generic term relating to present status of a unit of range in terms of specific values or potentials. Specific values or potentials must be stated or (b) the present state of vegetation of a range site in relation to the climax (natural potential) plant community for that site. It is an expression of the relative degree to which the kinds, proportions and amounts of plants in a plant community resemble that of the climax plant for the site.
Range Development, Nonstructural - Any practice designed to improve range condition or facilitate more efficient utilization of the range.
Range Development, Structural - Any structure or excavation to facilitate management of range or livestock.
Range Management - A distinct discipline founded on ecological principles and dealing with the use of rangelands and range resources for a variety of purposes. These purposes include use as watersheds, wildlife habitat, grazing by livestock, recreation, and aesthetics, as well as associated uses. Two kinds of range management can be described: **Extensive** range management carries the goal to control livestock numbers within the present capacity of the range, but little or no attempt is made to achieve uniform distribution of livestock. Range management investments are minimal and only to the extent needed to maintain stewardship of the range in the presence of grazing. Past resource damage is corrected and resources are protected from natural catastrophes. **Intensive** range management carries the goal to maintain full plant vigor and to achieve full livestock utilization of available forage. This goal is achieved through implementation of improved grazing systems and construction and installation of range improvements. Cultural practices, such as seeding and fertilizing, to improve forage quality and quantity may be used.
Range Readiness - Indicators used to determine rangeland readiness are soils and vegetation conditions. Rangelands are generally ready for livestock grazing when soils have become firm after winter and spring precipitation, and when plants have reached the defined stage of growth at which grazing many begin under the specific management plan without long-lasting damage
Rangeland - Lands on which the native vegetation is predominately grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing usage. Includes lands revegetated naturally or artificially to provide a forage cover that is managed like native vegetation.
Rangeland Health - The degree to which the integrity of the soil, the vegetation, the water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as: Maintenance of the structure and functional attributes characteristic of a particular locale, including normal variability.
Ranger District - Administrative subdivision of the national forest or national grassland supervised by a district ranger who reports to a forest supervisor.
Rare Communities - A ranking system used by The Nature Conservancy to assess relative endangerment. Community types are ranked on a global, national, and state scale of 1 to 5. A rank of G1 (Global 1) indicates that a community type

is critically imperiled globally to rarity, endemism, and/or threats. A rank of G5 indicates little to no risk of global elimination. Similar definitions apply to national and state rankings.
Regeneration - The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop itself.
Region - An administrative unit within the National Forest System lands, which includes national grasslands. The United States is divided into nine geographic regions. Each region has a headquarter office and is supervised by a regional forester. Each region contains national forests and sometimes national grasslands or other lands administered by the Forest Service.
Regional Forester - The official responsible for administering a single region.
Rehabilitation - Actions taken to restore or reclaim site productivity, water quality, or other values.
Renewable Resources - Resources that can be used indefinitely when the use rate does not exceed the ability to renew the supply. However, in the RPA program, the term is used to describe those matters within the scope of the responsibilities and authorities of the Forest Service as required by the Forest And Rangeland Renewable Resources Planning Act of 1974. Consequently, the renewable resources include: timber, range, minerals, wildlife and fish, water, recreation, and Wilderness.
Residual Cover – Standing or lodged herbaceous vegetation left after livestock grazing and killing frost.
Resource Values - The tangible and intangible worth of forest and grassland resources.
Responsible Official - The Forest Service employee who has the delegated authority to make a specific decision.
Rest - To leave an area of rangeland ungrazed by livestock or unharvested by mechanical methods for at least one year (12 consecutive months).
Rest Rotation (Livestock Grazing) - An intensive system of management where grazing is deferred on various parts of the range during succeeding years, allowing the deferred part complete rest for one year. At least two, but usually three or more, separate grazing units are required.
Restoration - Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume its resiliency to disturbances.
Revegetation - The reestablishment and development of plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through reforestation or reseeding.
Rhizome - A horizontal underground stem, usually sending out roots and above-ground shoots from the nodes.
Riparian - The bands and adjacent areas of water bodies, water courses, seeps, and springs whose waters provide soil moisture in excess of what is locally available. This results in a moister habitat than that found on the contiguous flood plains and uplands. Refers to land bordering a stream, lake, or tidewater, and generally implies a particular type of habitat physiognomy often characterized by an over story of trees or other large woody plants with a complex under story of other woody and/or herbaceous species.
Riparian Area - Areas of the aquatic and riparian ecosystems with distinctive resource values and characteristics that are geographically delineated (FSM 2526). Ecological units with distinctive vegetation, landform, soil, and water regimes consisting of the aquatic ecosystem and wet-to-moist areas located between aquatic ecosystems and adjacent terrestrial ecosystems. Includes floodplains and wetlands. Riparian ecosystems are distinguished by soil characteristics and distinctive existing or potential vegetation communities that are adapted to soils with consistently high levels of moisture.
Riparian Communities - Repeating, classified, defined and recognizable assemblages of plant or animal communities associated with riparian areas.
Riparian Ecosystem - A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water.
Risk Assessment - Process of gathering data and making assumptions to estimate short- and long-term effects on human health or the environment from particular products or activities.
Road - A general term denoting a way with at least two-wheel tracks for purposes of travel by vehicles greater than 50 inches in width.
Road Density - Road density refers to the miles of road per square mile. There are different road densities depending on what road types are being considered.
Forest Development Road Density: The miles of Forest Development Roads per square mile. This is the road density of the road system managed by the Forest Service for resource management.
Rocky Mountain Region - The Forest Service organizational units consisting of Colorado, Wyoming, part of South Dakota, Nebraska, and Kansas. Also known as Region 2.
Rotation - The planned number of years between the formation or regeneration of a crop or stand and its final cutting at a specified stage of maturity.

Rotation Grazing - A grazing scheme where animals are moved from one grazing unit (paddock) in the same group of grazing units to another without regard to specific graze/rest periods or levels or plant defoliation.
Runoff - The total stream discharge of water, including both surface and subsurface flow, usually expressed in acre-feet of water yield.
Rural Development - A partnership or program designed to enrich the cultural life, enhance the environment, provide employment, and improve living conditions in rural America.
Scoping Process - An early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to the proposed action. Identifying the significant environmental issues deserving of study and de-emphasizing insignificant issues, narrows the scope of the environmental impact statement accordingly.
Season-long Grazing (Livestock Grazing) - Allowing livestock to graze a single pasture throughout one growing season.
Secondary Range - Range that is lightly used or unused by livestock under minimal management and will ordinarily not be fully used until the primary range has been overused.
Sediment - Material suspended in water or deposited in streams and lakes.
Sediment Load - The solid material transported by a stream and expressed as the dry weight of all sediment that passes a given point in a given period of time.
Sediment Yield - Amount of sediment leaving an analysis area and entering a channel.
Seeps - A spot where water or petroleum flows from the earth, often forming the source of a small stream.
Self-sustaining Fish Population - A reproducing fish population that does not require supplemental hatchery stocking.
Sensitive Species - Those plant and animal species identified by Regional Foresters for which population viability is a concern, as evidenced by the following: Significant current or predicted downward trends in population numbers or density. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
Seral (Ecology) - A biotic community that is in a developmental, transitory stage in an ecological succession.
Seral Stages (Ecology) - The sequence of a plant community's successional stages to potential natural vegetation.
Significant Archeological Sites - Sites eligible for inclusion in the National Register of Historic Places as determined by the Forest Service in consultation with the State Historic Preservation Officer.
Silviculture - Generally, the science and art of tree management, based on the study of the life history and general characteristics of forest trees and stands, with particular reference to local factors. More particularly, the theory and practice of controlling the establishment, composition, constitution, and growth of forests for desired conditions.
Site Productivity - Production capability of specific areas of land.
Social Analysis - An analysis of the social (as distinct from the economic and environmental) effects of a given plan or proposal for action. Social analysis includes identification and evaluation of all pertinent desirable and undesirable consequences to all segments of society.
Soil Compaction - A physical change in soil properties that results in a decrease in porosity and an increase in soil bulk density and strength.
Soil Erosion - The detachment and movement of soil from the land surface by water or wind. Soil erosion and sediment are not the same.
Soil Productivity - The inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.
Soil Profile - A vertical section of the soil from the surface down through all of its layers into the parent material.
Soil Survey - A general term for the systematic examination of soils in the field and in laboratories; their description and classification; the mapping of soil types; the interpretation of soils according to their adaptability for various crops, grasses, and trees; their response to treatment for plant production or for other purposes; and their productivity under different management systems.
Special Uses - Improvements or activities owned or carried out by private individuals, corporations, or other business entities on National Forest System lands, including national grasslands, under the authorization of a permit.
Special-use Permits - A permit, term permit, lease, or easement that allows occupancy, use, rights, or privileges on National Forest System lands, including national grasslands (36 CFR 261.2).
Species - A group of potentially interbreeding populations that is reproductively isolated from other such groups.
Species of Local Concern – Species that do not meet the criteria for sensitive species status but may have declining trends in the Black Hills or those that are important components of diversity in the Black Hills.
Species Composition – The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

Species Diversity - A measurement that relates the density of individuals of a species in a habitat to the number of different species present in the habitat. The number of different species in a given habitat.
Species Viability - A species consisting of self-sustaining and interacting populations that are well distributed through the species' range. Self-sustaining populations are those that are sufficiently abundant and have sufficient diversity to display the array of life history strategies and forms to provide for their long-term persistence and adaptability over time.
Stabilization (Heritage Resources) - Arresting the deterioration of a damaged heritage resource in order to prevent further damage from occurring. Stabilization may include reconstructing portions of the heritage resource.
Standard - Actions that must be followed or are required limits to activities in order to achieve grassland or forest goals and objectives. Site-specific deviations from standards must be analyzed and documented in management plan amendments.
State Historic Preservation Officer (SHPO) - A person appointed by a state's governor to administer the State Historic Preservation Program.
Static – staying the same.
Stewardship - Caring for land and associated resources and passing healthy ecosystems to future generations.
Stocking Rate (Livestock Management) - The actual number of animals, expressed in either animal units or animal unit months, on a specific area for a specific time.
Stream Bank Alteration –Stream bank alteration consists of physical alteration of the bank by trampling that exposes bare soil.
Stream Bank Stability - Stream bank stability refers to long-term bank structure, expressed as a percentage of the stream bank in one of six stability classes (Cowley and Burton 2005b). It is intended for long-term trend monitoring and is read on 3-5 year intervals. This method includes damage from natural processes, such as floods, and human caused impacts, such as mining or recreation vehicle crossings, as well as from livestock.
Stream Health - The condition of a stream, relative to robust health, for that stream type and landscape, considering indicators such as channel pattern, slope, particle size, pool frequency and depth, bank vegetation, and woody debris, which reflect the stability and habitat quality of the stream.
Stream Order - A classification of the relative position of streams in a channel network. Each non-branching channel segment is designated as a first-order stream. The channel segment below the confluence of the two first-order tributaries. The channel segment below the confluence of two second-order streams is designated a third-order stream, etc.
Stream Type - A class of stream reach having a discrete combination of valley geomorphology and climate, flow regime, stream size, and channel morphology, which differs from other stream types in its ability to support biota and respond to management.
Stubble Height – The measurement of remaining vegetation within a riparian area after grazing has ceased. The height of residual vegetation after grazing influences attributes of channels and floodplains, sediment deposition, plant vigor, physical stability of riparian zones, and use of woody plant species. Water relationships of plants growing along banks may change with time and channel succession; as channel banks build, plant species composition of the near-bank riparian zone also may change as well.
Subspecies - A genetically distinct subunit of a species.
Succession - The progress of vegetation development where different plant communities successively occupy an area.
Successional Stages (Seral Stages) - The relatively transitory communities that replace one another during development toward a potential natural community.
Suitable Lands - Lands that are appropriate for the application of certain resource management practices as determined by an analysis of the economic and environmental consequences and the alternative uses foregone.
Suitable Rangeland - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses forgone. A unit of land may be suitable for a variety of individual or combined management practices.
Suspended Sediment - The very fine soil particles that remain suspended in water for a considerable period of time without contact with the bottom of the channel.
Sustainability - Continuation of a desired level of productivity, quality, or variability, generally of organisms.
Sustained Yield - The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources on National Forest System lands, including national grasslands, without impairment of the productivity of the land.
Terrestrial - A land-based ecosystem. (See ecosystem). An interacting system of soil, geology, and topography with plant and animal communities.

Tiering - Refers to the elimination of repetitive discussions of the same issue by referencing the general discussion in an environmental impact statement of broader scope. For example, a project environmental assessment could be tiered to the Forest Plan EIS.
Timber Production - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use, except fuel wood.
Timing Limitation (Seasonal Restriction) - Prohibits surface use during specified time periods to protect identified resource values. The stipulation does not apply to the operation or maintenance of production facilities unless the finding analysis demonstrates the continued need for such mitigation and the insufficiency of less stringent, project-specific mitigation measures.
TMDL – Total Maximum Daily Load
Topography - The configuration of a land surface including its relief, elevation, and the position of its natural and human-made features.
Traditional Use Areas - An area that is significant to a living community because of its association with cultural practices or beliefs that are rooted in the community's history and are important in maintaining the continuing cultural identity of the community.
Trail - The general term denoting a way for purposes of travel by foot, stock, or trail vehicle.
Trailhead - The parking, signing, and other facilities available at the terminus of a trail.
Transitory Range - Range that is lightly used or unused by livestock under minimal management and will ordinarily not be fully used until the primary range has been overused.
Trampling - Treading underfoot. The damage to plants or soil brought about by movements or congestion of animals.
Travel Management - Travel management is the movement of people and products to and through national forests and national grasslands. It connects many different varieties of user and multiple uses on National Forest System lands.
Treated Area - An area on which management, like timber harvesting or prescribed burning, occurs.
Trespass - The act of going on another's land or property unlawfully.
Understory (Vegetation) - The lowest layer of vegetation in a forest or shrub community composed of grass, forbs, shrubs and trees less than 10 feet tall. Vegetation growing under the tree canopy.
Undesirable Species - 1) Species that conflict with or do not contribute to the management objectives. 2) Species that are not readily eaten by animals.
Ungulate - A hoofed animal, including ruminants (cattle, but also horses, tapirs, elephants, rhinoceroses, and swine).
Unpalatable Species (Range Management) - Plant species that are not readily eaten by an ungulate animal.
Utilization Levels (Livestock Grazing) - The portion of the current year's forage production by weight consumed or trampled by livestock. Utilization levels are usually expressed as a percentage.
Validation Monitoring – This type asks the question: "Is there a better way to meet Forest Plan goals and objectives as expressed by a NEPA decision and displayed in an AMP?" An example of validation monitoring is the continual assessment of proper use guidelines to insure they reasonably describe the level of grazing use that encourages progress towards allotment objectives. Validation monitoring determines whether the information upon which standards, guidelines, and objectives are based is valid and correct.
Vegetation Structure – The vertical characteristics of vegetation.
Vegetation Treatment - Any activities undertaken to modify the existing condition of the vegetation.
Vegetative Buffer Zones - Strips of grass or other erosion-resisting vegetation between areas of ground disturbance and areas needing protection from sedimentation.
Vegetative Management - Any activities undertaken to modify the existing condition of the vegetation.
Viable Population - A group of individuals of a particular species that produces enough offspring for long-term persistence and adaptation of the species or population in a given place. For planning purposes, 36 CFR 219.19 defines a viable population as one that has the estimated numbers and distribution of reproductive individuals to ensure that a continued viable population is well-distributed in the planning area. A planning area is further defined by 36 CFR 219.3 as the "area of the National Forest System covered by a regional guide or forest plan." Direction estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.
Warm-Season Plant - A plant that makes most or all its growth during the spring, summer, or fall and is usually dormant in winter. A plant that usually exhibits the C4 photosynthetic pathway.
Water Cycle: Term used by Holistic Management to describe the movement of water from the atmosphere to the soil or oceans, and eventually back into the atmosphere. An effective water cycle is one in which plants make maximum use of rainfall, little evaporates directly off the soil, and any runoff caused no erosion and remains clear. Also a good air to water balance should exist in the soil, enabling plant roots to absorb water readily. For the water cycle to be effective in

brittle environments, the soil must be covered with living plants or litter, as vast amounts of water are lost through the bare, exposed soil between plants.

Water Development - A facility constructed or placed to hold water for livestock use.

Water Influence Zone - The water influence zone (WIZ) includes the geomorphic floodplain, riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is the greater of 100 feet or the mean height of mature dominant late-seral vegetation. It includes adjacent unstable and highly-erodible soils. The WIZ protects interacting aquatic, riparian, and upland functions by maintaining natural processes and resilience of soil, water, and vegetation systems.

Water Rights - Rights given by state and federal governments for the diversion and use of water.

Water Table - The upper surface of the ground water or that level below which the soil is saturated with water.

Waters of the United States - Waters used for navigation and all other waters such as lakes, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, and their tributaries.

Watershed - The area of land, bounded by a divide, that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel (Dunne and Leopold, 1978), or to a lake, reservoir, or other body of water. Also called drainage basin or catchment.

Weed - Any plant growing where unwanted and having a negative value.

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

Wetland Communities - Plant communities that occur on sites with soils typically saturated with or covered with water most of the growing season.

Wetlands - Those areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wildfire - Any wild land fire not designated and managed as a prescribed fire within an approved prescription. An appropriate suppression action will be applied to all wildfires.

Wildland/Urban Interface - This references those lands that are intermingled private and National Forest System lands where one encounters residential developments.

Wildlife - Collectively the no domesticated vertebrate animals, except fishes. The natural community of animals.

Winter Range - Rangeland that is grazed during the winter months.

Xeric - Having very little moisture. Tolerating or adapted to dry conditions.

Zone of Influence - A delineated geographic area within which the present and proposed actions exert an important influence on residents and visitors.

Wildlife Collectively the no domesticated vertebrate animals, except fishes. The natural community of animals.

CHAPTER 6 LIST OF PREPARERS

Interdisciplinary Team

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