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1.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The analysis area for rangeland resources analysis includes the Greens Hollow Federal Coal Lease Tract (Greens Hollow tract) and additional adjacent land that could be mined as part of the Greens Hollow tract (Area of Subsidence Mining), as shown on Figure 1 and totaling 8,887 acres. The analysis area also includes a 900-foot extended subsidence zone around the area that may be subject to mining that would encompass the subsidence impacts (Mining Analysis Area Boundary), bringing the total acreage considered in this analysis to 11,051 acres. The majority of the analysis area, 9,107 acres, lies within the Emery Cattle and Horse Grazing Allotment on the Manti-La Sal National Forest. A small parcel on the north is on the Ferron Cattle and Horse Grazing Allotment, also on the Manti-La Sal National Forest. A larger parcel on south end of the analysis area lies within the Quitchupah Cattle and Horse Grazing Allotment on the Fishlake National Forest. Table 1 indicates the acreage of the analysis area within each of the three allotments.

<table>
<thead>
<tr>
<th>Allotment</th>
<th>Acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery allotment – MLNF</td>
<td>9,107</td>
</tr>
<tr>
<td>Quitchupah allotment – FLNF</td>
<td>1,714</td>
</tr>
<tr>
<td>Ferron allotment - MLNF</td>
<td>203</td>
</tr>
<tr>
<td>Total</td>
<td>11,051</td>
</tr>
</tbody>
</table>

1.1 EMERY ALLOTMENT

The management emphasis for most of the Emery Allotment according to the Forest Plan (Forest Service 1986) is forage production. There are small areas designated for timber production, but there are no plans for timber harvest at this time. The management goals specified in the allotment management plan (AMP; p. 3) for the Emery allotment (Forest Service undated) are:

1. Bring forage use in line with rangeland carrying capacity.
2. Maintain upward or stable trends in vegetation and soil condition.
3. Invest in range improvements where they will improve livestock and resource management.
4. Monitor riparian areas to determine the trend and uses and improve existing conditions.
5. Maintain a program to treat and control noxious weeds.
6. Perpetuate aspen and sagebrush communities.
7. Control unauthorized livestock use.
8. Monitor big game populations and their impact on the forage resource.
Figure 1. Greens Hollow range allotments.

Legend:
- National Forest System Roads
- Greens Hollow Coal Least Tract
- Area of Subsidence Mining
- Mining Analysis Area Boundary
- Ferron Allotment
- Emery Allotment
- Quitchupah Allotment
- Manti-La Sal/Fishlake Forest Boundary
The Emery allotment includes 31,305 acres that are suitable for grazing and 18,207 acres that have been identified by the agency as not suitable because of physical characteristics (e.g., topography or access) or other land use priorities (Forest Service 2004a). Suitable grazing lands within the allotment produce an estimated 6,441 animal unit months (AUMs) of forage. An AUM is the amount of forage necessary to support a 1000 pound cow for one month. This equates to an average of 4.9 acres per AUM. Twelve livestock operators are permitted to graze 1,387 cows with calves on the allotment from June 16 through September 30.

Cattle are trailed on and off the allotment via Link Canyon. No trailing is allowed in Muddy Creek due to the narrow bottom, lack of forage, and importance of the area as big game winter range. The allotment is managed under a five-unit deferred rest rotation grazing system as per an approved AMP. Annually the Forest Service and livestock operators review the rotation schedule and document it in annual operating instructions (AOIs). Modifications to the allotment management plan are made in these AOIs as necessary based on water availability and forage production.

Long-term trend studies indicate that soil and vegetation conditions on the allotment as a whole are improving. The higher elevation portions are much more productive than lower lying areas. Soil trends are improving nonetheless (AMP, pp. 1 – 3). The coal tract generally lies at higher elevation, including portions of the Cowboy, Greens, and Mike’s Ridge units.

Costs of range improvement work are shared with benefiting permittees and cooperators such as the Division of Wildlife Resources and the Rocky Mountain Elk Foundation, in the form of labor or funding, as negotiated prior to project implementation. Vegetation manipulation efforts may require closure to grazing for periods up to three years following completion. (AMP, p. 7.)

1.2 FERRON ALLOTMENT

The management emphasis for most of the allotment according to the Forest Plan is forage production. The management goals specified in the AMP (p. 2) for the Ferron allotment (Forest Service 1994) are:

1. Bring forage use in line with rangeland carrying capacity and continue to monitor capacity.
2. Maintain upward or stable trends in vegetation and soil condition.
3. Invest in range improvements where they will improve livestock and resource management.
4. Maintain winter elk habitat and reduce livestock/elk conflicts.
5. Monitor riparian areas to determine the trend and uses and improve existing conditions.
6. Maintain a program to treat and control noxious weeds.
7. Perpetuate aspen and sagebrush densities.
8. Control unauthorized livestock use.
9. Monitor big game populations and continue to make recommendations for numbers according to their impact on the forage resource.

The Ferron allotment includes 26,763 acres suitable for grazing and 41,869 acres considered unsuitable (Forest Service 2004b). Suitable lands within the allotment produce 7,463 AUMs of forage. This equates to an average of 3.6 acres per AUM. Sixteen permittees graze 1,607 cow/calf pairs from June 21 through October 5.
Trailing onto and off of the allotment is permitted via Hole Trail, Dry Wash, and Ferron Canyon Road. Trailing schedules are arranged prior to the entry date. The northern part of the allotment is managed under a four-unit rest rotation grazing system. The southern part is under a rest/deferred system (AMP, p. 4). The northern buffer zone around the Greens Hollow Tract includes a small portion of the southern part of the allotment (Figure 1). The schedule of rotation is determined in the allotment management plan and documented in AOIs, based on water availability, forage production, and coordination with other resource management activities.

Long-term trend studies indicate that soil and vegetation conditions on the allotment as a whole are in a stable to upward trending condition. Some of the lower units are subject to sagebrush and conifer invasion that reduce forage production, but soil trends are still improving (AMP, p. 1). The coal tract extends into a portion of the Last Water unit.

### 1.3 Quitchupah Allotment

The management emphases for the Quitchupah allotment include habitat for indicator species, livestock, and watersheds. The resource objectives specified in the AMP (p. 2) for the Quitchupah allotment (Forest Service 1977) are:

1. A minimum ground cover of 60 percent. Some areas of the allotment are capable of 100 percent cover and the goal will be to achieve the maximum possible for the specific location.
2. Avoid livestock use on bare ridge areas. Through management practices these ridge areas should be improved and eventually brought back into production.
3. Control duration and season of use by livestock in the respective units.
4. Provide proper maintenance of range developments.
5. Maintain big game populations at a level commensurate with capacity of winter range areas.

The coal tract and buffer extend into the northern portion of the Quitchupah allotment in the Fish Lake National Forest. This allotment contains 27,985 acres, and provides 4,052 AUMs of forage (no information on suitability/unsuitability is available on this allotment). This equates to an average of 6.9 acres per AUM. Five permittees graze 813 cow/calf pairs on the allotment from June 11 through September 30.

Trailing on and off the allotment is permitted via Quitchupah Creek and Convulsion Canyon. The allotment is managed under a four-unit rest-rotation grazing system, with each unit receiving complete rest one out of every four years. The schedule of rotation is determined annually and documented in AOIs.

All indications are that the vegetation trend on the allotment is stable to upward. In terms of vegetation, it is one of the best allotments in the Richfield District of the FLNF (Tuttle 2008). The portion of the allotment in the analysis area generally lies at higher elevations (>8300 feet), and is within the Quitchupah unit.
1.4 OTHER INFORMATION

The portion of the Emery allotment within the analysis area includes 6,243 acres suitable for grazing. Calculated as a proportion of the allotment’s total, the portion of the allotment in the analysis area produces approximately 1,551 AUMs of forage. The portion of the Ferron allotment in the analysis area includes 1,074 acres suitable for grazing, or about 30 AUMs of forage. The portion of the Quitchupah allotment in the analysis area includes 1,714 acres, or about 248 AUMs of forage.

In terms of livestock grazing, stock water is the limiting factor on these allotments. Both water developments and undeveloped springs and creeks provide water for livestock. Extensive development of spring-fed troughs, stock ponds, and pipelines has occurred over time, and these water developments are in various states of repair. Most remain functional or potentially functional. Spring-fed troughs, of which there are 13 in the analysis area, provide the most reliable sources of stock water (Table 2). These are concentrated in the central portion of the analysis area, overlying the proposed mining. A pipeline system, the Greens Seeding pipeline (Improvement No. 202013), delivers water to multiple troughs at the north end of the tract.

<table>
<thead>
<tr>
<th>Improvement No.</th>
<th>Type</th>
<th>Name</th>
<th>Condition/Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>202007</td>
<td>Trough</td>
<td>Aspen Spring and Dugout Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>202011</td>
<td>Trough</td>
<td>Cowboy Trail #1</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202012</td>
<td>Trough</td>
<td>Cowboy Trail #2</td>
<td>Good</td>
</tr>
<tr>
<td>202014</td>
<td>Trough</td>
<td>Greens Seeding Trough #1</td>
<td>Good</td>
</tr>
<tr>
<td>202014A</td>
<td>Trough</td>
<td>Greens Seeding Trough #2</td>
<td>Good</td>
</tr>
<tr>
<td>202015</td>
<td>Trough</td>
<td>Greens Reseed Trough #1</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202018</td>
<td>Trough</td>
<td>Greens Hollow Trough</td>
<td>Good</td>
</tr>
<tr>
<td>202037</td>
<td>Trough</td>
<td>Cowboy Hollow Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>202037A</td>
<td>Trough</td>
<td>Cowboy Hollow Extension</td>
<td>Good</td>
</tr>
<tr>
<td>No Num</td>
<td>Trough</td>
<td>Cowboy hb Trough</td>
<td>Fair</td>
</tr>
<tr>
<td>202006</td>
<td>Trough</td>
<td>Big Ridge Spring and Trough</td>
<td>Not Rated</td>
</tr>
<tr>
<td>No Num</td>
<td>Trough</td>
<td>Dugout Trough</td>
<td>Not Rated</td>
</tr>
<tr>
<td>No Num</td>
<td>Trough</td>
<td>White Mountain Spring</td>
<td>Not Rated</td>
</tr>
<tr>
<td>M_SP02</td>
<td>Springbox</td>
<td>M_SP02</td>
<td>Good</td>
</tr>
<tr>
<td>M_SP08</td>
<td>Springbox</td>
<td>M_SP08</td>
<td>Not Rated</td>
</tr>
<tr>
<td>M_SP14</td>
<td>Springbox</td>
<td>M_SP14</td>
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<td>Not Rated</td>
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<tr>
<td>No Num</td>
<td>Springbox</td>
<td>White Mountain Spring</td>
<td>Not Rated</td>
</tr>
<tr>
<td>202017</td>
<td>Stock Pond</td>
<td>White Knolls</td>
<td>Fair</td>
</tr>
<tr>
<td>202033</td>
<td>Stock Pond</td>
<td>Greens Pasture Pond #1</td>
<td>Good</td>
</tr>
<tr>
<td>202036</td>
<td>Stock Pond</td>
<td>Greens Pasture #2</td>
<td>Fair</td>
</tr>
<tr>
<td>202038</td>
<td>Stock Pond</td>
<td>Green Pasture Pond</td>
<td>Good</td>
</tr>
<tr>
<td>202040</td>
<td>Stock Pond</td>
<td>Cowboy Pond</td>
<td>Good</td>
</tr>
<tr>
<td>202044</td>
<td>Stock Pond</td>
<td>Greens Pasture #3</td>
<td>Fair</td>
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<tr>
<td>202048</td>
<td>Stock Pond</td>
<td>Greens Hollow Trough Pond</td>
<td>Good</td>
</tr>
<tr>
<td>Unassigned</td>
<td>Stock Pond</td>
<td>North tributary on S. Fork Quitchupah Cr.</td>
<td>Not Rated</td>
</tr>
</tbody>
</table>
Undeveloped springs and creeks also provide important water sources for grazing livestock. Undeveloped springs include both springs that have adequate flow for livestock to drink but have not been developed yet as well as springs that do not have sufficient flow to warrant development. The upper reaches of Cowboy Creek often provide adequate water for livestock grazing purposes without development.

Developed stock ponds and natural ponds probably provide more water but on a less reliable basis. There are eight developed stock ponds in the analysis area (Table 2). These ponds collect runoff from spring snowmelt and summer/fall rainstorms. As a result, the amount of water and spatial coverage they provide is highly dependent on climatic conditions. During the five years of drought which occurred in the early part of this decade, many of the stock ponds were periodically dry during the course of the grazing season. All stock ponds were empty during a July 2008 site visit. The presence of water in natural ponds throughout the summer is more likely influenced by the rate of ground water discharge than the ability to capture surface runoff. Although water levels in natural ponds were noted to decrease during the summer, few natural ponds dried up entirely. In regard to other range improvements, there are about 8.8 miles of fence in the analysis area.

2.0 ASSESSMENT/DESCRIPTION OF ENVIRONMENTAL CONSEQUENCES BY ALTERNATIVE

2.1 ALTERNATIVE 1– NO ACTION DIRECT AND INDIRECT EFFECTS

Under the No Action Alternative, the tract would not be leased and no mining would take place on the Greens Hollow Tract. Thus subsidence-related damage to range improvements would not occur. Water resources would not be affected, and grazing would likely continue as under current management, involving the same permitted numbers and season of use, the same permittees, and the same inventory of range improvements.

2.2 ALTERNATIVE 2 – PROPOSED ACTION DIRECT AND INDIRECT EFFECTS

Issue 1: Subsidence could damage range improvements and facilities, including spring developments.

As discussed above, stock water is the most limiting resource on the allotments. The most reliable water sources in the analysis area are the 13 spring-fed water troughs on the Emery allotment. Potential mining impacts to spring flows are discussed in detail in the Surface and Ground Water report for this analysis (Cirrus 2013). Overall, the Surface and Ground Water analysis concludes that the risk of loss of groundwater at an individual spring is very low, but it does note potential impacts due to surface tensile cracking for four springs with water troughs: M_SP02, which feeds Greens Hollow Trough (202018), as
well as Greens Pasture #1 Pond; M_SP08, which feeds Aspen Spring Trough (202007); M_SP18, which feeds Greens Seeding Trough (202014), as well as Greens Seeding Trough (202014A) via the Greens Seeding pipeline; and the White Mountain Spring which has a springbox and feeds a trough. Since subsidence mining would be allowed under perennial streams and perennial stream flow could be altered, (Cirrus 2013), the importance of developed stock water sources would potentially increase under the Proposed Action.

Springs within the zone of subsidence could potentially be affected by subsidence, causing shallow groundwater feeding the spring to be redirected and surface further downslope. Water is not anticipated to be lost into the mine due to the depth of overburden above the coal seams. The Surface and Groundwater Report (Cirrus 2013) concludes that the likelihood of loss of water due to tensile fractures or compression stress is very low due to the thickness of the overburden (greater than 1,300 feet) and the depth of fine sediments overlying the Castlegate Sandstone where the springs are located. However, it is difficult to specifically assess the risk of affecting a particular spring because the impact depends in part on the location of gate roads and panel boundaries where any tensile cracks that form may not heal as well.

Similar to springs, the stock ponds in the analysis areas overlying mine panels could also be impacted due to subsidence-induced tensile fractures and cracking and experience water loss. Most of the ponds in the analysis area are filled by surface water runoff, although Greens Pasture #1 Pond is feed by spring M_SP02 and if subsidence reduced flows from the spring, the water level in that pond would be affected. The same factors discussed above that would minimize the risk of water loss to springs would also reduce the likelihood of long-term impacts to the ponds, namely the depth of overburden and the embedded silts and clays that would help heal any cracks that form. Because of the depth of overburden and fine sediments overlying the Castlegate Sandstone, the actual risk of cracking risk would be low, so damage would be unlikely. If cracking did occur, the impacts would likely be of short duration, as cracks are projected to heal relatively quickly due to the silts and clays. Because mining in the lease tract would occur over a 8.8-year time period, potential impacts would tend to be localized at any given time, i.e., if a pond were affected by tensile cracks, it would probably have time to heal before another pond was affected.

Although the likelihood of a water source being affected by subsidence is considered to be low, the following discusses the implications if such an impact were to occur. The costs of repair or replacement would be one measure of the cost of subsidence impacts. However, any temporary or permanent loss stock water resources could have a larger indirect effect by limiting livestock distribution, thereby reducing the forage base. This in turn would reduce either the number of cattle the allotment could support or the length of the grazing season.

Addressing this issue requires assessment of the type of stock water developments (i.e., relatively reliable spring-fed troughs v. less reliable stock ponds) and their distribution. For planning purposes, cattle are assumed to travel up to a mile for water without being stressed in mountainous terrain. In reality, cattle on less mountainous terrain in arid western ranges typically travel substantially greater distances.

As noted, spring-fed troughs are the most reliable water source and are concentrated in the central portion of the analysis area. Of the troughs or trough systems potentially affected by subsidence, Cowboy Trail #2 spring-trough system (202012) is currently the most productive in terms of water volume. In the case of the Aspen Spring Trough (202007), the other water sources within a mile radius are the trough at Big Ridge Spring (202006) nearly a mile east and the Dugout Trough 0.3 miles to the southwest. To the north, alternative sources are from one to two miles away. Similarly, the Greens Hollow trough (202018) has
alternate sources within a mile to the north (Greens Seeding Trough (202014)) and west (Greens Pasture #1 pond (202033)) and the pond on the Greens Hollow tributary. The nearest water to the west, Clay Springs Pond, is 1.6 miles away. However, since Greens Pasture #1 stock pond (202033) is less than 500 feet east of the trough, it would serve as a backup water source for the mile radius around the trough. For purposes of this analysis, it is assumed that in the unlikely event that the flow to Aspen Spring or Greens Hollow troughs ceased, other water sources would be available.

Cowboy Trail #2 trough has 2 water sources, including a spring box at spring M_SP14. If subsidence affected the springs in this area, both springs would likely be affected. The nearest alternate water sources are White Mountain Springs at 1.5 miles and Aspen Springs and trough and 1.7 miles. Approximately 45 percent of the area within this radius is in the Greens Hollow tract. In total, the loss of this trough would make about 2,024 acres on the tract within a 1 mile radius of the trough unavailable for grazing due to lack of water. At 4.9 acres per AUM, this would equate to 413 AUMs, or 6.3 percent of the forage within the Emery Allotment.

White Mountain Spring is bordered to the south by a boundary fence, so the water it provides is only available to cattle grazing on Emery allotment. There are no water sources within 1 mile of this spring. Therefore, the loss of this water source would make unusable about 781 acres of forage. At 6.9 acres per AUM in this allotment, this would result in a loss of 113 AUMs, or approximately 2 percent of the forage within the Emery Allotment.

The ponds that may be subject to damage from mining activities are all located on the northern end of the tract. Two ponds, Greens Pasture #1 (202033) and Green Pasture (202038), are located next to water troughs; Greens Hollow Trough (202018) and Greens Reseed Trough (202015) for the former and Greens Seeding Trough (202014A) for the latter. Furthermore, both ponds are less than a mile from Greens Seeding Trough (202014, to the west) and White Knolls pond (to the east). Also, Greens Pasture pond #1 is less than a mile northeast of Cowboy Pond and the Cowboy Hollow Trough. Therefore, it is not anticipated that damage to these ponds would make inaccessible any forage on the allotment.

Issue 2: Subsidence impacts to water resources could affect livestock permit operations. Direct, indirect, and cumulative impacts to water resources, including but not limited to points of diversion or use and vegetation may change all or a portion of the area from primary range to secondary range, and impact grazing capacity.

If continued, widespread impacts to water resources were to occur in the analysis area due to mining in the Greens Hollow tract and other adjacent leases; livestock permit operations may be affected. Mining activity, including subsidence, may cause changes in points of diversion or use of surface water. Such changes, if they were to occur, would be expected to have minimal effect on the forage production on the allotments. However, impacts to grazing could result due to the loss of water from developed and undeveloped water sources, making that forage unavailable and negatively impacting grazing capacity. If effects were severe enough, grazing on project-area allotments could be reduced or eliminated.

Based on the conclusion reached by the water resource specialists (Cirrus 2013), the likelihood of loosing a significant number of water sources for the allotments due to mine subsidence impacts would be very low due to the depth of overburden and the clays and shales present in the area. It is more likely that if springs were affected, these effects would occur to individual springs as the mining and subsidence progressed across the landscape, and these impacts would be short term because cracks would tend to heal due to the clays and shales present in the analysis area. The discharge points for some springs may move down slope as the cracks heal, compromising the function of the existing water develops, but there is not
expected to be a net loss of water. Special Stipulation #13 requires existing Forest Service owned or permitted surface improvements need to be protected, restored, or replaced to provide for the continuance of current land uses. A mitigation measure has been included to address this potential impact. Springs that do coincide with gate roads may be more at risk of a long-term impact because subsidence cracks above gate roads may not heal quickly. Therefore, based on the assessment in the Surface and Ground Water Technical Report (Cirrus 2013), livestock permit operations are not expected to be affected by Alternative 2.

2.2.1 OTHER RANGE IMPROVEMENTS
In terms of other range improvements, including fences, gates/cattle guards, and grazing enclosures, surface cracking would be the source of potential damage. The conclusions from the Assessment of the Effects of Surface Impacts Resulting from Longwall Mining in the Greens Hollow Tract (Maleki 2008) regarding surface cracking summarized above for stock ponds are also relevant to these other range improvements. No other range improvements lie in the zone of moderate to high cracking risk. Low and negligible cracking hazard is not considered a threat to range improvements other than water developments as discussed above, so potential impacts to improvements in those zones due to cracking are not discussed further.

Livestock trailing onto and off of the Emery allotment via Link Canyon and the Ferron allotment via Hole Trail, Dry Wash, and Ferron Canyon Road would not be affected by the Proposed Action. The Greens Hollow tract would be accessed be via underground mine workings underground from the adjacent SUFCO Mine and would not affect livestock trailing.

2.2.2 PROBABILITY, DURATION, AND COST OF POTENTIAL IMPACTS
In general, this analysis addresses only moderate to high probability impacts site specifically. However, because of the importance of reliable, spring-fed stock water sources, the potential impact to the spring feeding the Cowboy Trail #2 trough is considered here even though it would be a very low probability occurrence. As noted above, an estimated 413 AUMs per season could be made unavailable, reducing the forage base in the allotment by 6.3 percent. This loss would be reflected each season until an alternative source of stock water in the area was developed. This analysis assumes that permittees would have to lease private range to offset this forage loss. A potential short-term solution would be for water to be delivered to affected areas by truck during the grazing season, as currently takes place at some troughs outside the Greens Hollow tract. Long-term solutions would include redeveloping the spring if its discharge point changes due to subsidence, as noted in Section 3.0.

As mentioned above, the ponds within the mining tract are close enough to backup water developments that the loss of any of these ponds would not make any AUMs unavailable. In the event of damage, the mine would be responsible for the cost to replace or repair any improvements damaged by subsidence, including loss of surface water inflow into the ponds due to changes in the drainage patterns.

In terms of replacement costs, the Ferron Ranger District has recent experience with damaged spring-fed troughs (Forest Service 2004c). Troughs can be repaired for as little as $1,500 while new troughs cost about $3,000. The cost of replacing lost AUMs by leasing private range is estimated to range from $12 to $15 per AUM (Forest Service 2004c).
Based on this assessment of potential damage and these repair/replacement costs, the replacement of AUMs that would be lost if Cowboy Trail #2 trough became unavailable due subsidence impacts would be about $6,195 per grazing season, and replacing AUMS lost due to unavailability of White Mountain Spring would cost about $1,695. This is a conservative estimate of potential costs based on the impacts projected through this analysis. As discussed, there is an element of uncertainty in projecting the impacts associated with subsidence on range improvements. The cited impacts might not occur, eliminating these repair/replacement costs. On the other hand, if additional water developments or other range improvements were damaged, costs would increase proportionally. Additional costs could be projected based on the figures presented above. If damage to water development did result in reduced forage availability, the cost of leased rangeland to offset the reduction could be calculated using the figures included in this analysis.

2.3 ALTERNATIVE 3 DIRECT AND INDIRECT EFFECTS

Impacts to range resources associated with Alternative 3 would essentially be the same as those described for Alternative 2.

2.4 SPECIAL STIPULATIONS AND DESIGN CRITERIA

- Stipulation #7 would require that flow at springs, including M_SP08 be monitored to detect changes during and after mining.

- Compliance with Stipulations #13 and #17 would guide protection, restoring or replacing surface range improvements if damaged and redeveloping the spring or water source at a new location.

3.0 CUMULATIVE EFFECTS

This section considers the cumulative effects of the proposed Greens Hollow tract project in the context of other past, on going, and reasonably foreseeable projects that have affected rangeland resources in the cumulative effects analysis area. The cumulative effects analysis area as defined for the rangeland resources analysis includes portions of the Muddy Creek and Quitchupah Creek watersheds that encompass the landscape setting for the Greens Hollow tract project. Table 2.1 in the SEIS lists specific past, present, and future activities affecting the cumulative effects analysis area that were considered in this analysis. Actions that are relevant to cumulative effects analysis are discussed below.

3.1 REASONABLY FORESEEABLE POST-LEASE SURFACE USE ON THE GREENS HOLLOW TRACT

- Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

Reasonably foreseeable construction and operation of a ventilation shaft would require a total of approximately 10 acres within the Emery or Quitchupah Allotment. This land would be unavailable for grazing for the life of the mine, until these sites are reclaimed. At 4.9 acres/AUM, the average forage level of the suitable grazing areas of the allotment, this would result in the loss of approximately 2
AUMs. Even factoring in a buffer area around the ventilation shaft site that cattle may be likely to avoid, this represents a trivial percentage of the estimated 6,441 AUMs on the Emery Allotment or 4,052 AUMs on the Quitchupah Allotment. Replacement of the lost AUMs could be required. Replacement could possibly be accomplished by a rangeland improvement to increase the overall AUMs on the allotment.

3.2 Reasonably Foreseeable Post-Lease Surface Use Outside the Greens Hollow Tract

- Reasonably foreseeable construction of a ventilation shaft facility could reduce grazing land.

Reasonably foreseeable construction and operation of a ventilation shaft facility would require a total of approximately 10 acres within the Emery or Quitchupah Allotment. This land would be unavailable for grazing for the life of the mine, until these sites are reclaimed. At 4.9 acres/AUM, the average forage level of the suitable grazing areas of the allotment, this would result in the loss of approximately 2 AUMs. Even factoring in a buffer area around the ventilation shaft site that cattle may be likely to avoid, this represents a trivial percentage of the estimated 6,441 AUMs on the Emery Allotment or 4,052 AUMs on the Quitchupah Allotment. Replacement of the lost AUMs could be required. Replacement could possibly be accomplished by a rangeland improvement to increase the overall AUMs on the allotment.

The effects of this project would be cumulative with other impacts occurring in the area. Coal mining has occurred throughout the cumulative effects analysis area. Historic mining includes the Link Canyon Mine in Link Canyon and the Ricci Mine in Muddy Creek. Ongoing and future mining includes the SUFCO, Pines Tract, and West Lease mining. In general, the effects of coal mining have been limited. Surface disturbance is primarily restricted to the portal site. However, coal mining on adjacent coal lease tracts could impact rangeland resources, including forage and water availability. Subsidence due to mining in the Pines tract adjacent to the Greens Hollow tract has impacted springs in the North Water area that were used to support livestock grazing in the North Water springs area. Flow from several spring locations and their associated riparian/wetland habitat was lost due to subsidence. Loss of this livestock water has been offset temporarily by hauling water, but long-term water replacement options are still pending. Forage lost due to mine infrastructure would also be cumulative with losses associated with the Greens Hollow tract. If water is lost due to subsidence and efforts to replace it are unsuccessful, this could cause primary range to be reclassified as secondary range. This could result in a decrease in total AUMs for the allotment, and a subsequent loss to the livestock permittees, but this loss would represent a very small portion of the range resource available in the analysis area. Fundamental differences exist between the Pines Tract and the Greens Hollow tract. Trying to predict the amount of rangeland that could change from primary to secondary range would be speculative due to the specific location of the water source and distance to forage. It is not expected that this type of impact would occur, particularly under Alternative 3.

Impacts of any future exploratory drilling would be assessed separately from this EIS. Exploration drilling across the cumulative effect area has occurred in the past and is likely to continue as coal reserves are developed. Depending on location and how the holes are drilled (conventional vs. heliportable drill), the amount of disturbance for access and the drill site varies. Drill hole sites would temporarily decrease available forage; however, only a negligible amount of forage would be affected, and effects would be dispersed across a large area. Cumulative impacts from exploratory drilling to rangeland resources would be minimal, if any.
Wildlife improvement projects have impacted rangeland resources in the past and additional improvement projects are likely in the future. Past habitat improvement projects include 400 acres of sagebrush burned in the Pines Tract to improve elk winter range. Current habitat improvement projects include disking and Dixie harrowing 800 acres to restore sage-grouse habitat for nesting and brood rearing. Future projects include a 700-acre controlled burn. The effects would be greatest at the time of the project, and would have a short-term adverse impact on forage resource availability. As the areas recover, increased forage resources would become available. Livestock may be excluded for multiple years to facilitate recovery. Wildlife foraging does result in some direct competition for forage resources, but such interactions have a limited effect on the rangeland forage resource available in the analysis area. Implementation of the Proposed Action or Alternative 3 would have minimal cumulative effect with wildlife habitat improvement projects or forage use for rangeland resources.

Recreation use does occur across the analysis area. Impacts from recreation can include loss of forage associated with off-road ATV/vehicle use and dispersed camping. Although these impacts result in the loss of forage resources, the impacts are usually localized and affect a very small percentage of the forage resource on the allotments and would result in a negligible cumulative effect. The Rough Brothers of the Hills permit will not be renewed and the cabin must be removed by December 31, 2016, therefore, there would not be any meaningful cumulative impacts.

The East Fork Box Creek Timber Sale and the Link Canyon Timber Sale occurred 25 years ago. Removal of trees during the timber sales likely would have increased forage production in the understory, but such effects would tend to diminish over time and would not result in meaningful cumulative impacts with the current project.

Construction of Forest Roads for grazing, mining, recreation, timber operations, and private land access affects rangeland resources in the cumulative affects analysis area. Roads have both positive and negative effects. Roads facilitate access for range improvement projects and management actions, but would also result in the loss of a very small amount of forage base. The Proposed Action would not result in the construction of new roads, but unauthorized use could occur along sections of the power line that do not currently have roads.

The implementation of the Proposed Action or Alternative 3 could conflict with rangeland resources, as noted in Section 2.2 and 2.3. Such impacts are generally anticipated to be relatively minor and temporary or short term but would be cumulative with the other impacts to rangeland resources from the past, present, and reasonably foreseeable actions considered in this section. Potential loss of water sources would potentially represent the most notable impact and would be cumulative with the water loss at the North Water area. All reasonably foreseeable future development on NFS lands would be required to be consistent with management requirements of the Forest Plan.

4.0 REFERENCES AND LITERATURE CITED


Forest Service. 2004b. GIS coverage of areas within tracts and buffers determined to be suitable for grazing. Manti-LaSal National Forest, Ferron Ranger District. Ferron UT.

