

Biological Evaluation for U.S. Forest Service Designated Sensitive Terrestrial Wildlife Species

For

Weminuche Landscape Grazing Analysis

San Juan National Forest,
Columbine Ranger District,
Hinsdale, La Plata and San Juan Counties,
Colorado



Prepared By:

/s/ Chris Schultz

Chris Schultz
Wildlife Program Leader
Columbine Ranger District

Date: 1/27/2016

Contents

INTRODUCTION.....	3
FIELD RECOGNIZANCE.....	4
PROJECT INFORMATION.....	4
Location.....	4
Purpose and Need.....	5
Desired Conditions (see EIS Section 1.4):.....	6
Existing Conditions (see EIS Section 1.3):.....	7
Temporal Scale.....	8
Alternatives.....	8
Alternative 1 – No Action/No Livestock Grazing:.....	9
Alternative 2 - Current Management:.....	9
Alternative 3 – Adaptive Management w/ Forage Reserves Alternative:.....	10
Alternative 4 – Adaptive Management/Closing Vacant Allotments Alternative, the Preferred Alternative:.....	14
Design Criteria for Alternatives 3 and 4:.....	14
Monitoring for Alternatives 3 and 4:.....	15
EXISTING VEGETATION.....	17
SPECIES CONSIDERED.....	25
BIOLOGICAL EVALUATION FOR SENSITIVE SPECIES.....	25
Discussion Of Effects To Forest Service Sensitive Species.....	30
Sensitive Species with habitat in the analysis area but not affected by the action Alternatives (see Table 6, above):.....	30
Sensitive Species with habitat in the analysis area and possibly affected by the action Alternatives (see Table 6, above):.....	33
White-tailed ptarmigan.....	33
Direct and Indirect Effects.....	35
Alternative 1 –No Action.....	36
Alternative 2 (Current Management):.....	36
Alternative 3 (Adaptive Management with Forage Reserves):.....	36
Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):.....	37
Cumulative Effects.....	38
Determination.....	39
North American Wolverine.....	40
Direct and Indirect Effects.....	41
Alternative 1 –No Action.....	42
Alternative 2 (Current Management):.....	42
Alternative 3 (Adaptive Management with Forage Reserves):.....	43
Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):.....	44
Cumulative Effects.....	45
Determination.....	45
Rocky Mountain bighorn sheep.....	45
Direct and Indirect Effects.....	58
Alternative 1 –No Action.....	58
Alternative 2 (Current Management):.....	61
Alternative 3 (Adaptive Management with Forage Reserves):.....	62
Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):.....	63
Cumulative Effects.....	65
Determination.....	66
Effects of Selecting Alternative 1 (all Sensitive Species) – No Grazing.....	66
Effects of Selecting Alternative 2 (all Sensitive Species) – Current Management.....	66
Effects of Selecting Alternative 3 (all Sensitive Species) – Forage Reserves.....	67
Effects of Selecting Alternative 4 (all Sensitive Species) – Preferred Alternative.....	69
Cumulative Affects for all Sensitive Species.....	71
LITERATURE CITED.....	73

Figures

Figure 1. Weminuche Grazing Analysis Landscape. 80
Figure 2. Weminuche Grazing Analysis Vegetation Monitoring Points. 81
Figure 3. Alternative 2 (Current Condition) Overlap of Domestic Sheep Allotments with Bighorn Sheep Core Herd Home Range in the Weminuche Landscape. 82
Figure 4. Alternative 3 (Forage Reserves) Configuration of Domestic Sheep Allotments and Bighorn Sheep Core Herd Home Ranges in the Weminuche Landscape. 83
Figure 5. Alternative 4 (Preferred Alternative) Configuration of Domestic Sheep Allotments and Bighorn Sheep Core Herd Home Ranges in the Weminuche Landscape. 84

Tables

Table 1. Field Survey results. 4
Table 2. Current Domestic Sheep Grazing, by Allotment, in the Weminuche Landscape. 10
Table 3. Status of allotments under Current Management (Alternative 2), under the Forage Reserves Alternative (Alternative 3), and under the Preferred Alternative (Alternative 4) in the Weminuche Landscape grazing analysis area. 11
Table 4. Acres of wildlife habitat on National Forest System lands in the Weminuche Landscape analysis area. Acres suitable for domestic sheep grazing are counted for active, vacant, and forage reserve livestock allotments only. 18
Table 5. Weminuche Landscape vegetation sampling points and results. 24
Table 6. Forest Service Region 2 Sensitive Terrestrial Wildlife Species list for the San Juan National Forest based on August 14, 2015 (FSM R2 Supplement 2600-2015-1). 26
Table 7. Summary of Qualitative ratings of the risk of physical contact between domestic and bighorn sheep by allotment under Alternative 2 (current management), Alternative 3 (forage reserves), and Alternative 4 (Preferred Alternative) in the Weminuche Landscape grazing analysis area. 50
Table 8. Relative ranking of alternatives based on multiple measures of separation between domestic sheep and bighorn sheep. 60

INTRODUCTION

Forest Service Manual (FSM) 2670 requires reviews of all Forest Service planned, funded, executed or permitted programs and activities for possible effects to Forest Service designated sensitive wildlife species. The process used to evaluate the effects agency activities and programs may have on designated sensitive species is in accordance with the standards established in 50 CFR 402.12, and Forest Service Manual Direction (FSM 2672.4). U.S. Forest Service (USFS) Region 2 sensitive species are designated by the Regional Forester of the Rocky Mountain Region.

The purpose of this Biological Evaluation (BE) is to evaluate the potential effects from domestic livestock grazing in the Weminuche Landscape on terrestrial wildlife species designated as sensitive by the USFS Rocky Mountain Regional Forester and that are known to occur or have the potential to occur on NFS lands managed by the Columbine Ranger District of the San Juan National Forest. Potential affects to sensitive fish species were analyzed in a separate document and will not be reviewed here.

Analyzing and disclosing the effects of this grazing analysis project on designated sensitive species is needed to meet Forest Service Manual 2670 direction for sensitive species management as described in FSM 2672.4. This analysis is also needed to meet agency obligations under the National Forest Management Act (NFMA) of 1976 and the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C.4321 et seq.), as amended.

Sensitive species addressed in this BE are from the most recent USFS Rocky Mountain Region list (FSM R2 Supplement 2600-2015-1).

Domestic livestock grazing, both sheep and cattle, has occurred in the Weminuche Landscape for over a century and has been authorized by the Forest Service since the early 1900's. The current San Juan National Forest Land and Resource Management Plan of 2013 (Forest Plan), along with Allotment Management Plans (AMPs) and Grazing Permits, regulate the current numbers and type of livestock, dates of use, salting, vegetation manipulation and other activities undertaken for the purpose of grazing domestic livestock on NFS lands.

Domestic sheep are the primary livestock permitted to graze in the Weminuche Landscape, and their principle forage areas are in the alpine zone. Alpine rangelands in this Landscape have been used for grazing domestic sheep since the late 1800's. Prior to government control, sheep were herded in tightly grouped bands and continuously bedded in the same location for several nights in a row, which resulted in some areas of intense forage utilization and soil impacts from trampling and trailing. Some sites in the Weminuche Landscape still display these historic effects of long periods of intensive domestic sheep grazing decades after the allotments were last grazed. There are no additional bands of domestic sheep being grazed on adjacent or intermingled non-federal lands, in addition to the bands permitted to graze on the Forest Service allotments under analysis in this document.

Loosely herded sheep, like the ones under current management practices in this Landscape, will aggregate in large groups when resting or drinking then gradually split up into smaller groups as they graze away from water or bed grounds. Sheep are considered "intermediate feeders" meaning they utilize grasses, forbs, and shrubs, and have the ability to adjust their feeding habits to whatever is available. Sheep generally prefer forbs, but they also readily utilize grasses, and depending on the season, may consume roughly equal amounts of forbs and grasses, including some sedges. Leaves are the most readily grazed portions of most plants. Selectivity of forage species may vary with the stage of plant maturity, location,

The only allotment in the Weminuche Landscape with currently permitted cattle grazing is the Canyon Creek Allotment. Canyon Creek Allotment however, will be analyzed as either a cattle allotment or a domestic sheep allotment, but not both classes of livestock simultaneously. A portion (1,544 acres) of the West Needles Allotment, which was closed to grazing in the Silverton Grazing Analysis, is proposed to be added to existing allotments and re-authorized for domestic sheep grazing under this EIS.

FIELD RECOGNIZANCE

Table 1. Field Survey results.

X	Field surveys were completed on numerous dates in 2010, 2011, and 2012 including: June 17, July 20–21, 26-29, August 10-12, 17, 23-27, September 14-17, 21, and October 16, 2010; December 4, 11, 28, and 31, 2011; January 5, 15, 21, 28, February 18 and 25, 2012; 2013, 2015 and 2015 by Chris Schultz, District Wildlife Biologist.		
	No field survey is required.		
	A field survey is needed, but cannot be completed by required date due to:		
	Inappropriate season	Inadequate lead time	Higher priorities

Reviews of records and biological files were conducted on numerous dates from 2010 through 2015.

PROJECT INFORMATION

LOCATION

The Weminuche Landscape is located Hinsdale, La Plata and San Juan Counties, Colorado. The area is located northeast of Durango in Townships 36-40 North, Ranges 4-9 West, N.M.P.M., and is within the Columbine Ranger District of the San Juan National Forest (see Figure 1, at the end of the document). Most of the Weminuche Landscape analysis area is within the congressionally designated Weminuche Wilderness, the largest single wilderness area in the state of Colorado.

The Weminuche Landscape includes about 166,627 acres, of which about 162,599 acres (98%) is National Forest System (NFS) land. The remaining 4,028 acres are split out between Durango Reservoir Grant lands (City Reservoir) at 2,962 acres, and private lands at 1,066 acres. On National Forest System lands, 85% of the analysis area is in the Weminuche Wilderness. The remaining 15% is non-wilderness.

Within the Weminuche Landscape, domestic sheep grazing is currently permitted on about 57,983 acres (36%) of National Forest System (NFS) lands in 5 active allotments (Burnt Timber, Endlich Mesa, Spring Gulch, Tank Creek, and Virginia Gulch), and 8 vacant allotments (Canyon Creek, Cave Basin, Fall Creek, Flint Creek, Johnson Creek, Leviathan, Pine River, and Rock Creek). Approximately 58,408 acres (36%) of NFS lands are suitable for domestic sheep grazing, and 50,239 acres (31%) of NFS lands are suitable for cattle grazing.

The majority of the Weminuche Landscape analysis area is located west and south of the Continental Divide, in extremely rugged and colorful volcanic mountains, with elevations ranging from about 7,200 feet to 14,100 feet. The Florida and Pine Rivers as well as Vallecito Creek have their headwaters in the analysis area. The analysis area is principally alpine tundra, mountain grassland, and spruce-fir forest. There are smaller areas of aspen, mixed conifer, ponderosa pine, and mountain shrub communities. Cirques and talus slopes, along with numerous streams, fens, and lakes add diversity to the rugged landscape.

Various sections of roads and trails may be used for trailing livestock. Some of these trailing routes are outside the Weminuche Landscape but they have been included in this analysis because they are integral to the function and management of allotments within the Weminuche Landscape.

Various sections of roads and trails may be used for trailing livestock. Some of these trailing routes are outside the Weminuche Landscape but they have been included in this analysis because they are integral to the function and effective management of the Landscape's allotments.

The trailing routes include the following:

U.S. Hwy 160, County Roads 151, 172, 240, 243, 318, 319, 421, 501, 502, 521, 523, 527, Forest Roads #076 (Red Rim #2), #081 (Lime Mesa), #595 (Red Rim), #597 (Endlich Mesa), #602 (Pine River), #682 (Missionary Ridge), #724 (Middle Mountain), #775 (Saul's Creek), and sections of the Pine River Trail #523, Vallecito Creek Trail #529, Cave Basin Trail #530, Young's Canyon Trail #546, and Lime Mesa Trail #676. This analysis also includes a pre-existing right of way across MacDonald Becket Family Trust properties, and their successors, for access to the Canyon Creek allotment and cattle allotments in an adjacent Landscape (Missionary).

PURPOSE AND NEED

The purpose of this action is to administer term livestock grazing on all or portions of the Weminuche Landscape in such a manner that will meet or move existing resource conditions toward desired conditions, and be consistent with the Forest Plan direction, including standards and guidelines (USDA Forest Service 2013c). The site-specific need for those areas where desired conditions are currently being met is to maintain or improve current conditions. The site-specific need for change for those areas which are not meeting or moving toward desired conditions is to bring existing conditions up to, or moving towards the desired conditions in a timely manner.

This Biological Evaluation (BE) analyzes the effects of domestic livestock (sheep and cattle) grazing in the Weminuche Landscape on terrestrial wildlife species designated as sensitive in the Rocky Mountain Region (Region 2) by the Rocky Mountain Regional Forester and that are known to occur or have potential to occur on NFS lands in the Weminuche Landscape.

The need for change in management is identified by comparing what currently exists on the landscape in the project area to specific descriptions of what should exist (desired conditions) in

the different community types across the project area. The interdisciplinary analysis team defined project-specific desired conditions for this landscape (see EIS Section 1.4). If project-specific desired conditions are being met, then Forest Plan Direction will also be met.

The need for action (change) is created by the disparity between the existing condition and desired condition. Where desired conditions are currently being met, the need is to maintain current conditions. Where desired conditions are not being met, the need is to change management actions such that conditions meet or move toward desired conditions in an acceptable timeframe. The methods used to determine existing conditions are described in the Weminuche Landscape Grazing Analysis Environmental Impact Statement (EIS).

Desired Conditions (see EIS Section 1.4):

The desired conditions, standards, and guidelines listed in the Forest Plan, and the 1998 Wilderness Management Direction, provide a basis for the definition of site-specific desired condition goals. For this project, landscape scale desired conditions are defined for the entire analysis area, and site-specific desired conditions are defined for benchmark sites and/or key areas. Benchmark areas are sites sensitive to changes in land management activities, represent the key resources and concerns associated with the project, and are used to measure long-term conditions and trends relative to project activities. Key areas are implementation monitoring sites and serve as annual monitoring sites. Key areas may also serve as benchmark sites for long-term trend monitoring. Benchmark and/or key areas do not necessarily represent conditions over entire allotments. Some benchmark areas and key areas have been established and more may be established as needed in the future. Benchmark areas and key areas will generally be open meadows or other areas in suitable range most likely to be grazed by permitted livestock. The desired conditions defined by the Interdisciplinary Team are as follows:

At the Landscape Scale:

- **Bighorn Sheep:** Reduce or eliminate overlap between active domestic sheep allotments and mapped bighorn sheep summer ranges. Prevent physical contact between bighorn sheep and domestic sheep. Manage domestic sheep to achieve effective separation from bighorn sheep.
- **Allowable Use:** Utilization guidelines are met across the analysis area, as defined in the Forest Plan.
- **Noxious Weeds:** No increase in noxious weeds in the analysis area as a result of domestic sheep grazing activities.

At the Site-specific Scale:

- **Plant Community:** Native grass and forb species continue to dominate in both the short and long term.
- **Upland Rangeland Health:** Rangelands are Healthy with a stable or upward trend; or if At-Risk, the trend is upward. Vigor and production on all grass and forb species is high. There is no increase in noxious weeds as a result of domestic sheep grazing activities. There is no soil loss off-site, and no pedestaling or gully formation occurs as a result of domestic sheep grazing activities.
- **Riparian Health:** Riparian conditions are Functional; or if Functional-At Risk, the trend will be upward.

Existing Conditions (see EIS Section 1.3):

The need for a change in management is identified by comparing what is desired across the landscape (desired conditions) to what currently exists on the landscape in the analysis area (existing conditions). In 2009-2012, the FS collected data to document existing conditions across the landscape.

Existing Conditions for Riparian and Upland Vegetation: A total of 53 vegetation monitoring points were sampled across 11 of the 13 livestock allotments in the Weminuche Landscape, including all of the allotments that would be open to domestic sheep grazing under any action alternative, and the Cave Basin allotment that would be available to cattle grazing as a forage reserve under Alternative 3 (see Figure 2 at the end of the document). No monitoring points were conducted in the Flint Creek or Fall Creek Allotments because these two allotments are proposed to be closed under all of the action alternatives.

Of the 53 vegetation monitoring points, a total of 38 (72%) were upland monitoring points and 15 (28%) were riparian monitoring points. All 38 upland monitoring points were rangeland health matrix (RHM) samples, and all 15 riparian monitoring points were proper functioning condition (PFC) samples.

Of the 53 monitoring points, 50 (94%) met the project's desired conditions, and 3 (6%) did not. Of the 50 points that met the project's desired conditions, 44 (88%) were rated "Healthy" with a "Stable" trend, and 6 (12%) were rated "At Risk" with an "Upward" trend (5 upland points, and 1 riparian point). All six points that were rated "At Risk" with an "Upward" trend met the project's desired conditions because, although in need of improvement, their condition was judged to be getting better over time and progressing toward those expected for their particular site. The three monitoring points (6%) that did not meet the project's desired conditions were an upland point in Canyon Creek Allotment (healthy with a downward trend), an upland point in Canyon Creek Allotment (At Risk with a downward trend), and a riparian point in Virginia Gulch Allotment (At Risk with an unapparent trend).

Examination of the body of available data reveals that, for the project area at the overall landscape level, vegetative conditions are meeting desired conditions (94% of the data points). However, there are isolated areas of concern noted by FS personnel, specifically at bed grounds and trailing "choke points." More detailed descriptions of the data can be found in Affected Environment of the Water and Vegetation sections in Chapter 3 of the EIS.

Existing Conditions for Bighorn: There are currently about 46,053 acres of mapped overlap between domestic sheep allotments and bighorn sheep summer range (Core Herd Home Range; as mapped by Colorado Parks and Wildlife) in the Weminuche Landscape (see Figure 3 at the end of the document). A total of 2,457 acres of mapped overlap are in active allotments, and 43,596 acres are in vacant allotments. This existing condition is undesirable due to potential for physical contact between domestic sheep and bighorn sheep, with the potential for contact leading to the possibility of disease transmission between the two species.

Existing Conditions for Wilderness: Because the desired conditions for wilderness are related primarily to vegetation conditions, the conclusions for existing wilderness conditions are generally the same as for vegetative existing conditions, in that existing conditions are generally meeting desired conditions. However, there were isolated locations within wilderness (Emerald and Pearl Lakes, along the Lime Mesa Trail, Stump Lakes, and Burnt Timber Trail) where conditions were noted to be of concern

Temporal Scale

Two time frames are referred to throughout this analysis, short-term and long-term. Short-term refers to the immediate 10-year period (2015-2025) and long-term is considered beyond ten years (2025+).

ALTERNATIVES

The Weminuche Landscape Environmental Impact Statement (EIS) evaluates four alternatives. The preferred alternative (Alternative 4) is to re-authorize domestic sheep grazing on all or portions of NFS lands in the Weminuche Landscape through an adaptive management process (Quimby 2005) that would meet or move resource conditions toward desired conditions, and be consistent with Forest Plan resource direction, Standards and Guidelines. The EIS does not authorize nor analyze grazing on non-NFS lands which are intermixed with NFS lands across the Weminuche Landscape. Below, is a brief summary of the four alternatives analyzed in the EIS. For more detailed information about each alternative, please see the Environmental Impact Statement section .

1 – No Action Alternative whereby domestic livestock grazing would not be reauthorized in the Weminuche Landscape.

2 – Current Management Alternative involving traditional livestock management using a predefined number of livestock (domestic sheep only) and specific grazing dates and allotment configurations.

3 – Adaptive Management w/ Forage Reserves Alternative. This alternative is to continue to permit domestic livestock grazing on NFS lands by incorporating a variety of Adaptive Management strategies (Quimby 2005) that will allow the lands within the landscape to meet or move towards meeting Forest Plan direction standards, and guidelines and desired conditions identified in the EIS. Adaptive Management strategies are “tools” or management actions designed to maintain suitable resource conditions, or move unacceptable resource conditions towards desired conditions (Quimby 2005). Adaptive Management is designed to be flexible in regards to livestock numbers and season dates.

This alternative would incorporate adaptive management options for the active grazing allotments (Burnt Timber, Canyon Creek, Endlich Mesa, Spring Gulch, Tank Creek and Virginia Gulch), including boundary adjustments, trailing, and design criteria (see EIS section 2.3; and Tables 2-3, 2-4 and 2-5). This Alternative would authorize the Canyon Creek Allotment to be converted from sheep to cattle, but would also allow the allotment to remain a vacant domestic sheep allotment that could be restocked administratively with sheep at a later date. For this reason, the Canyon Creek Allotment is analyzed as both an active cattle allotment and a vacant sheep allotment, but not both classes of livestock in the same year. This Alternative would authorize the creation of a new domestic sheep forage reserve allotment out of portions of the Johnson Creek, Leviathan and Rock Creek Allotments. The remaining four vacant sheep allotments (Cave Basin, Fall Creek, Flint Creek, and Pine River) would be closed to domestic sheep grazing. Finally, a cattle forage reserve allotment would be created out of the lower third of the Cave Basin Allotment. See the EIS for a detailed list of specific actions that would be authorized under this Alternative.

4 – Adaptive Management/Closing Vacant Allotments Alternative, the Preferred Alternative. The preferred alternative is to continue to permit domestic livestock grazing on

NFS lands by incorporating a variety of Adaptive Management strategies (Quimby 2005). Adaptive Management strategies are “tools” or management actions designed to maintain suitable resource conditions, or move unacceptable resource conditions towards desired conditions. Adaptive Management is designed to be flexible in regards to livestock numbers and season dates.

This alternative would incorporate all the adaptive management options of Alternative 3 for the active grazing allotments (Burnt Timber, Canyon Creek, Endlich Mesa, Spring Gulch, Tank Creek and Virginia Gulch), including boundary adjustments, trailing, and design criteria. The difference between this Alternative and Alternative 3 is that all seven currently vacant allotments (Cave Basin, Fall Creek, Flint Creek, Johnson Creek, Leviathan, Pine River, and Rock Creek) would be entirely closed to domestic sheep grazing. No forage reserves, sheep or cattle, would be authorized. See the EIS for a detailed list of specific actions that would be authorized under this Alternative.

Those design criteria as indicated in the EIS Tables 2-3, 2-4 and 2-5 by an “x” in the Alternative 4 column are included as part of Alternative 4. These criteria apply to all active allotments across the landscape at all times. For Alternative 4, design criteria would be the same as Alternative 3 for active allotments, but would not apply to closed allotments.

Alternative 1 – No Action/No Livestock Grazing:

Under the No Action/No Livestock Grazing Alternative, no livestock grazing would be permitted on any of the allotments in the Weminuche landscape. “No action” is synonymous with “no livestock grazing” and means that livestock grazing would not be authorized within the Landscape. Following current direction, existing permits would be phased out after giving permittees notice as provided for in Forest Service policy (FSH 2209.13). The ‘no livestock grazing’ alternative is developed and analyzed in detail and is therefore considered a fully viable alternative in this analysis. Improvements such as corrals would eventually be removed as time and funding allow. This alternative provides an environmental baseline for evaluation of the remaining three action alternatives.

Alternative 2 - Current Management:

Under Current Management, livestock grazing would continue with current AMP’s or, in the absence of such a plan or if the existing plan is not being followed for a variety of reasons, under the Annual Operating Instructions (AOI’s). Livestock grazing under a term permit would continue to be authorized as it has been in the recent past using a pre-defined number of livestock, seasons of use, and pasture rotation systems. For the allotments in this analysis, the permitted livestock numbers are shown below in Table 2. All six currently stocked allotments would continue to be active and the seven vacant allotments would remain vacant. The vacant allotments would be available for permitted livestock grazing through grant and issuance of term grazing permits with stocking based on historic numbers and adjusted based on suitability on each allotment. If the FS were to choose to offer the vacant allotments for grazing, the grant process would be followed and new term grazing permits would be offered, possibly to new permittees. Canyon Creek, which is currently being grazed by cattle, could revert to sheep grazing. Furthermore, the class of livestock on any allotment could change as long as purpose and need, desired conditions, and design criteria are met.

Existing improvements continue to be maintained as assigned in Term Livestock Grazing Permits and may be re-constructed once the useful life has been met and the need identified. New improvements would not be developed unless they are authorized in a NEPA decision. Sheep allotments typically do not have structural improvements except for corrals and loading facilities.

Permitted livestock numbers and dates and the last year of actual use for each allotment is shown below in Table 2.

Table 2. Current Domestic Sheep Grazing, by Allotment, in the Weminuche Landscape.

Allotment	Total Acres	Permitted Numbers	Actual Use (5-Year Average)	On Date Range	Off Date Range	Days of Use	Last Year of Actual Use
Burnt Timber-Tank Creek Band	5,092	700	700	6/25 - 7/5	9/15 - 10/1	28	2015
Burnt Timber-Virginia Gulch Band	*	850	775	6/26 - 7/6	9/16 - 10/1	27	2015
Burnt Timber-Canyon Creek Band	*	600	600	6/24 - 7/4	9/14 - 9/30	28	2010
Canyon Creek	6,328	600 Sheep, Or 120 Cattle	120 Cattle	5-July 11July	13-Sept 30-Sept	71	2010 2015
Endlich Mesa	11,222	700	775	1-July	4-Oct	96	2015
Spring Gulch	3,077	700	700	6/15 - 6/30	9/22 - 10/5	16	2015
Tank Creek	10,884	700	700	6-July	14-Sept	71	2015
Virginia Gulch	12,571	850	775	10-July	15-Sept	68	2015
Cave Basin	22,452	750	**	1-July	15-Sept	77	1988
Fall Creek	11,383	1,000	**	1-July	15-Sept	77	1969
Flint Creek	16,359	950	**	1-July	15-Sept	77	1972
Johnson Creek	9,461	388	**	1-July	15-Sept	77	1968
Leviathan	6,530	582	**	1-July	15-Sept	77	1970
Pine River	38,843	850	**	1-July	15-Sept	77	1980
Rock Creek	10,880	850	**	1-July	15-Sept	77	1970
Total	165,059	5,700	5,625				

**N/A, allotments vacant more than previous 5 years

~Active allotments are shaded in the table~

Alternative 3 – Adaptive Management w/ Forage Reserves Alternative:

This alternative is to continue to permit term livestock grazing on the Weminuche Landscape by incorporating adaptive management strategies that would allow the lands within the landscape to meet or move towards meeting Forest Plan desired conditions identified in this EIS. Adaptive management is a process where land managers implement management practices that are consistent with Forest Plan standards and guidelines, and would likely achieve the desired conditions in a timely manner. However, if monitoring shows that desired conditions are not being met, or if movement toward achieving the desired conditions in an acceptable timeframe is not occurring, then an alternate set of management actions, as described and evaluated under this

NEPA analysis, would be implemented to achieve the desired results. Adaptive Management is designed to be flexible in nature, and is based on conditions on the ground; not regulated by fixed livestock numbers, type of livestock, or seasons of use. It can be compared to a performance-based contract that is written with specifications for the end results, rather than written with detailed specifications on how to accomplish the job. The class of livestock on any allotment could change as long as purpose and need, desired conditions, and design criteria are met.

It should be noted that some allotment boundaries have been administratively adjusted between the preceding EA and this EIS; some of those items that were proposed in the EA such as changing allotment boundaries have already been accomplished administratively. This was done in order to correctly display the current conditions and how the landscape is actually being used. Administrative boundary adjustments can be done at any time without a NEPA decision per 36 CFR 222.(a) (7) and FSH 2209.13 sec 16.1.

This alternative continues to permit domestic livestock grazing (sheep) on five active allotments (Burnt Timber, Endlich Mesa, Spring Gulch, Tank Creek and Virginia Gulch), and permits sheep grazing on portions of three currently vacant forage reserve allotments (Johnson Creek, Leviathan and Rock Creek). Cattle would be authorized on portions of the currently vacant Cave Basin forage reserve allotment. See additional forage reserve discussions below. Sheep or cattle would be authorized on the Canyon Creek Allotment, but not both simultaneously. Adaptive management strategies would be incorporated into all permitted livestock grazing allotments (see Table 3, below).

Table 3. Status of allotments under Current Management (Alternative 2), under the Forage Reserves Alternative (Alternative 3), and under the Preferred Alternative (Alternative 4) in the Weminuche Landscape grazing analysis area.

Allotment	Current Management (Alternative 2)	Forage Reserve (Alternative 3)	Preferred Alternative (Alternative 4)
Burnt Timber-Tank Creek Band	Active Sheep	Active Sheep	Active Sheep
Burnt Timber-Virginia Gulch Band	Active Sheep	Active Sheep	Active Sheep
Endlich Mesa	Active Sheep	Active Sheep	Active Sheep
Spring Gulch	Active Sheep	Active Sheep	Active Sheep
Tank Creek	Active Sheep	Active Sheep	Active Sheep
Virginia Gulch	Active Sheep	Active Sheep	Active Sheep
Burnt Timber-Canyon Creek Band	Vacant Sheep	Vacant Sheep	Vacant Sheep
Canyon Creek	Vacant Sheep	Vacant Sheep, Active Cattle	Vacant Sheep, Active Cattle
Cave Basin	Vacant Sheep	Cattle Forage Reserve	Closed
Fall Creek	Vacant Sheep	Closed	Closed
Flint Creek	Vacant Sheep	Closed	Closed
Johnson Creek	Vacant Sheep	Sheep Forage Reserve	Closed
Leviathan	Vacant Sheep	Sheep Forage Reserve	Closed
Pine River	Vacant Sheep	Closed	Closed
Rock Creek	Vacant Sheep	Sheep Forage	Closed

		Reserve	
--	--	---------	--

~Active allotments are shaded in the table~

Boundary adjustments would be made to Tank Creek and Virginia Gulch allotments to reduce the potential for contact between domestic sheep and bighorn sheep, more accurately reflect natural geographic and vegetation boundaries, and better reflect potential and actual domestic sheep use areas on the ground. As part of the boundary adjustments, the western-most parts of Tank Creek would be closed to grazing. In response to a request from the Permittee, in 2013 the Canyon Creek Allotment was converted administratively from domestic sheep to cattle grazing. The allotment would remain a vacant sheep allotment and available for restocking administratively at a later date.

The northern 2/3 of Rock Creek Allotment (7,344 acres), all of Leviathan Allotment (6,530 acres), and most of Johnson Creek Allotment (7,780 acres) would be designated as sheep forage reserves (see additional forage reserve discussions below). The remaining parts of Johnson Creek (1,681 acres) and Rock Creek (3,536 acres) allotments would be closed to grazing. Three other vacant allotments would be closed to grazing: Fall Creek, Flint Creek and Pine River. The entire Cave Basin Allotment would be closed to sheep grazing. However, the southern quarter of the Cave Basin Allotment would be designated a cattle forage reserve allotment. The Canyon Creek allotment was converted administratively to a cattle allotment in 2013 at the request of the permittee, and is analyzed as a vacant sheep allotment. Access to allotments would continue through trailing from private lands to National Forest System lands. The USFS has no authority to authorize, or not authorize, use of trailing routes on non-National Forest lands.

Forage reserve is a specific designation for an allotment on which there is no current term permit, but for which a determination has been made to permit occasional livestock use for the purpose of enhancing management flexibility in other National Forest allotments. For this analysis, forage reserve allotments are reserved for occasional use by livestock authorized in another allotment, when their allotment has a loss of forage availability due to a variety of potential factors such as drought, fire, rangeland restoration activities, or resource conflicts. Also for this analysis, occasional use is defined as grazing the forage reserve for a maximum of three years out of any ten consecutive years. This limitation is due to current and historical grazing conditions that preclude annual grazing on these allotments

Generally, grazing of forage reserves is authorized through the issuance of temporary permits, but these temporary permits may be converted to term permits administratively under certain circumstances. For this analysis, a forage reserve would be expected to be used no more than two years out of ten, and would not exceed a total of 3 years out of any 10 consecutive years. If use is proposed to exceed this, then an interdisciplinary analysis team would need to verify that conditions on the ground are appropriate for that level of use. See design criteria (EIS Tables 2-3, 2-4 and 2-5) for further requirements to graze forage reserves.

All applicable standards and guidelines from the Forest Plan would be applied, and all potential future livestock grazing would incorporate adaptive management strategies, which use monitoring and a variety of "tools," or actions, to reach or maintain desired resource conditions. The adaptive management process allows for dealing with uncertainty and changing conditions over time, and focuses on the end results of meeting or moving towards desired conditions, as opposed to detailing specific seasons of use, permitted livestock numbers, and grazing rotations. In the context of this document, this means that a course of action (design criteria) is selected as a starting point that is believed to best meet or move toward the desired objectives. Monitoring would occur that evaluates results which would be used by the Interdisciplinary Team and the Line Officer to make adjustments to management as needed to ensure adequate progress toward

the defined objectives. All adaptive actions would be within the scope of effects documented in the EIS.

Alternative 4 – Adaptive Management/Closing Vacant Allotments Alternative, the Preferred Alternative:

The primary difference between the preferred alternative (Alternative 4) and the Forage Reserves Alternative (Alternative 3) is that all seven currently vacant sheep allotments (Cave Basin, Fall Creek, Flint Creek, Johnson Creek, Leviathan, Pine River, and Rock Creek) would be entirely closed to domestic sheep grazing. No sheep forage reserves would be authorized. No cattle forage reserves would be authorized. As in Alternative 3, the Canyon Creek Allotment would remain an active cattle allotment and be analyzed as a vacant sheep allotment. All other actions described in the Forage Reserve Alternative (Alternative 3) would also be implemented in the preferred alternative (Alternative 4), including incorporating adaptive management strategies that would allow the lands within the landscape to meet or move towards meeting Forest Plan direction, standards, and guidelines and desired conditions identified in the EIS (see EIS Tables 2-3, 2-4 and 2-5, and Figure 5 at the end of this document) and monitoring.

Since the EA was converted to an EIS, a few changes were made in the proposed action. The so-called “sunset clause” on active sheep allotments was dropped; refer to section 2.1 of the EIS for rationale. Additionally, information has been included regarding which allotments, or portions of allotments, would be authorized for which classes of livestock.

It should be noted that some allotment boundaries have been administratively adjusted between the preceding EA and the EIS. This was done in order to correctly display the current condition of how the landscape is actually being used for grazing. Administrative boundary adjustments can be done at any time without a NEPA decision per 36 CFR 222.(a) (7) and FSH 2209.13 sec 16.1.

Design Criteria for Alternatives 3 and 4:

The Forest Service uses many measures to reduce or prevent negative impacts to the environment in the planning and implementation of management activities. The application of these measures begins at the planning and design phase of a project. The Forest Plan standards and guidelines and the direction contained in the Watershed Conservation Practices Handbook (FSH 2509.25) and the Range Management Handbook (FSH 2200) are the first protection measures to be applied to the project. These sources are incorporated by reference and are not reiterated here. Other Design Criteria are then developed, as the need is identified by FS specialists and the authorized officer.

In response to internal and public comments on the proposal, design criteria were developed to ease some of the potential impacts and to help achieve the Desired Conditions. Alternatives 3 and 4 include direction for meeting certain resource conditions using monitoring and a variety of adaptive management “tools”, or actions, to reach or maintain those conditions. Adaptive Management is designed to be flexible in regards to livestock numbers, season dates, and class of livestock. General design criteria apply everywhere across the landscape at all times.

Some of the design criteria presented in the EIS Tables 2-3, 2-4, and 2-5 have been used for years or are commonly used practices throughout the western United States and have been found to be effective in reducing potential impacts. Many standard operating procedures that have been used in the past will continue. These design criteria apply to all active allotments across the landscape at all times. Each bullet statement applies to a specific action alternative as indicated by an “X” in the far right columns. Depending on the alternative selected, the applicable design criteria become a part of the project-level decision and the resultant Allotment Management Plans. For Alternative

4, design criteria would be the same as Alternative 3 for current active allotments, but would not apply to closed allotments.

Alternatives 3 and 4 contain design criteria intended to reduce the potential for contact between domestic sheep and native bighorn sheep (see Table 5, below). Design criteria to minimize conflicts in high-use recreational areas have also been added. Also included in these alternatives are specific action items included in site-specific design criteria detailed below Tables 4, 5 and 6.

Site-Specific Design Criteria for Alternatives 3 and 4

The project design criteria detailed in the EIS Tables 2-3, 2-4 and 2-5 are applicable to the entire project area. During 2009-12 field analyses, some specific locations were identified as having a “need for change”. These sites were determined to have a need for change if they do not currently meet the Desired Condition. Site-Specific Adaptive Management Options were developed under each alternative. The site-specific criteria developed for each alternative are described in the EIS under each respective alternative. They apply only to those locations and alternative, but apply at all times livestock are present in that area.

A further list of potential actions is listed in the EIS in Table 2-6 (p.**Error! Bookmark not defined.**). These actions could be incorporated at any time in the future to supplement those identified as design criteria, or to accelerate the rate at which existing conditions are moving toward the desired conditions. This list is not all-inclusive. New science and management techniques may be incorporated as needed or when they are developed. Some practices alone may not meet the desired condition, but in combination with other practices, desired conditions should be met or moved toward. For example, a two-unit deferred livestock grazing system alone may not provide the anticipated result, but when coupled with low stocking rates and construction of additional water developments, desired conditions should be met.

Monitoring for Alternatives 3 and 4:

A monitoring plan has been developed for Alternatives 3 and 4 and is outlined in Section 2.4 of the EIS. Monitoring will occur and results evaluated by the Interdisciplinary Team and the Line Officer to determine what adjustments are needed to ensure adequate progress toward meeting desired conditions. The monitoring plan was developed to ensure design criteria have a high probability of resulting in the desired resource outcomes and conditions over the short and long term. Areas currently meeting desired conditions would be monitored per guidance described in the monitoring section of the EIS to ensure that desired conditions are maintained into the future.

Two types of monitoring are associated with AMPs; *implementation* monitoring and *effectiveness* monitoring. Implementation monitoring occurs at key areas and measures whether or not permit stipulations and Forest Plan guidelines are being met. Effectiveness monitoring occurs at benchmark sites and evaluates how effective management actions are at moving toward or achieving desired conditions.

Monitoring is both the responsibility of the Forest Service and range permittee. If at any time, the results of monitoring indicate guidelines, or desired resource conditions are not being achieved as predicted, then adaptive management strategies will be implemented to move towards and/or meet desired conditions.

Monitoring is both the responsibility of the Forest Service and range permittee. If at any time, the results of monitoring indicate guidelines, or desired resource conditions are not being achieved as predicted, then adaptive management strategies would be implemented to move towards and/or meet desired conditions.

Implementation (Short-Term) Monitoring:

Annual monitoring techniques will be used in a dynamic and cyclic process. As results are received and analyzed each year, adjustments to the Annual Operating Instructions (AOI) are made for the following year. The AOI's clearly explain how each allotment is to be managed on a year-to-year basis. These instructions become part of the Term Livestock Grazing Permit for each permittee and responsibility for carrying out the instructions falls to the permit holder. The AOI's include instructions for pasture rotations, numbers to be grazed, pasture on and off dates, standards for and determination of allowable use, improvement maintenance and construction, and general allotment operating procedures. This allows annual livestock grazing management to adapt to fluctuations in short-term factors such as range readiness, precipitation, and other local events like fire. By allowing these short-term adjustments to livestock grazing, Forest Plan Direction is likely to be met.

Range Implementation Monitoring: Allotment Inspections are typically conducted annually as part of rangeland administration (based on budget constraints). Annual monitoring includes a combination of factors described in detail in section 2.4 of the EIS, but the list of factors may be revised should other techniques be developed that are more effective in monitoring permit compliance and desired conditions. Annual monitoring includes requirements for bighorn sheep, a designated sensitive species in Region 2. These include the following:

- *Bighorn Sheep Implementation Monitoring:*

Active Sheep Allotments:

Presence/absence monitoring of bighorn sheep within each active allotment should continue as long as an allotment remains active (1 out of 5 years). If bighorn sheep are detected at any point, a determination would be made if design criteria are sufficient to prevent physical contact between domestic sheep and bighorns. If it is determined that design criteria are not adequate to prevent physical contact, then measures would be utilized (adaptive management options) to prevent physical contact, which could include adjustment of allotment boundaries, or closing allotments to domestic sheep grazing.

Monitoring efforts should be coordinated with Colorado Parks and Wildlife and the Pagosa Ranger District, due to bighorn distribution across administrative boundaries.

Forage Reserve Sheep Allotments (Alternative 3 only):

Bighorn sheep surveys would be conducted on forage reserve allotments prior to stocking to determine presence or absence of bighorn sheep, and on an annual basis if allotments are stocked. At least two months written notice must be given by requesting permittee to allow enough time for required surveys to be completed. Design criteria and adaptive management options would be the same as for active sheep allotments.

Effectiveness (Long-Term Trend) Monitoring:

Role of Effectiveness Monitoring: An important role of monitoring is to determine whether management and identified design criteria are successful at moving rangeland resources towards desired conditions. Determining trend toward or away from allotment desired condition objectives allows rangeland managers to determine the relative success of the management system and to adjust management to accomplish objectives.

What Would be Monitored and Where: The long-term health of riparian and upland herbaceous resources would be monitored at benchmark areas selected by the Interdisciplinary Team. These

sites may be key areas or other primary range sites where resource concerns have been identified or where resource concerns have arisen due to changing ground conditions as noted from annual monitoring results. Long-term trend monitoring would not be conducted if the allotments are not stocked, or for temporary grazing permits.

Monitoring Methods and Frequency: The long-term health of riparian and upland vegetative resources may be monitored at benchmark sites on each allotment using one or more of the following methods as needed. Monitoring methods are listed in the EIS in section 2.4 and are approved methods described in the Region 2 Rangeland Analysis and Management Training Guide (USDA 1996). Monitoring methods may be revised should other techniques be developed that are better at monitoring the effectiveness of design criteria.

The long-term health of *riparian areas* will be monitored at riparian sites on active allotments at varying intervals using a variety of methods described in detail in the EIS section 2.4.

Application of Monitoring Results through Adaptive Management:

If the results of implementation or effectiveness monitoring determine that the desired conditions of riparian and/or upland herbaceous resources are not being met, and satisfactory progress is not occurring in moving toward the desired conditions, the Interdisciplinary Team would determine which management actions identified in the design criteria are ineffective. The Team would then determine which adaptive management technique(s) should be implemented to reverse the undesirable trend and which the Team believes would begin moving the site resource(s) of concern towards the desired conditions. The Interdisciplinary Team would make its recommendations to the District Ranger who, after discussions and input from the affected permittee, would decide what action(s) should be taken. The effectiveness monitoring cycle would begin again to monitor the implementation and effectiveness of the newly applied adaptive management actions. Adaptive management options that may be used listed in the EIS in Table 2-6 **Error! Reference source not found..**

EXISTING VEGETATION

See the vegetation affected environment section of the EIS, section 3-3, for a detailed description of current vegetation conditions in the Landscape. Table 4 (below) shows the amount of wildlife habitat in each general wildlife habitat type in the Weminuche Landscape, and the percentage of the Landscape comprised by each general wildlife habitat type, based on Geographic Information System (GIS) habitat modeling.

The Weminuche Landscape contains about 163,573 acres of wildlife habitat on National Forest System lands (Table 4, below). An additional 583 acres of National Forest outside the Landscape would be crossed by sheep and cattle trailing across lower elevation lands enroute to permitted allotments within the Landscape. Areas suitable for domestic sheep and cattle grazing are far less than the total amount of habitat in the Landscape. Areas suitable for sheep grazing are estimated to be about 36% (58,019 acres) of the Landscape under current management (Alternative 2), but would be only about 19% (31,547 acres) of the Landscape under Alternative 3, and would be only about 17% (27,602 acres) of the Landscape under Alternative 4.

Current management (Alternative 2) does not permit cattle grazing within the Weminuche Landscape. Under current management (Alternative 2), Canyon Creek Allotment is considered a vacant sheep allotment currently stocked administratively with cattle. The livestock permittee

requested to convert Canyon Creek from sheep to cattle grazing, and the allotment has been stocked with cattle temporarily since the 2013 grazing season. For this reason, under Alternative 2, the Canyon Creek Allotment will be analyzed as both a vacant sheep allotment that could be restocked administratively with sheep at a later date, and as a cattle allotment, but not both classes of livestock simultaneously. Under Alternatives 3 and 4, the Canyon Creek Allotment will be analyzed as an active cattle allotment and vacant sheep allotment. Under Alternative 3, the southern third of the Cave Basin Allotment would be a cattle forage reserve allotment, available for stocking with cattle for a maximum of three years out of any ten consecutive years.

Areas suitable for cattle grazing are estimated to be about 31% (49,995 acres) of the Landscape under current Management (Alternative 2), but would be only about 5% (7,589 acres) under Alternative 3, and would be about 8% (13,733 acres) under Alternative 4.

Table 4. Acres of wildlife habitat on National Forest System lands in the Weminuche Landscape analysis area. Acres suitable for domestic sheep grazing are counted for active, vacant, and forage reserve livestock allotments only.

Wildlife Habitat Type	Total FS Acres in Analysis Area		Acres (%) Suitable for Grazing under Current Management Alternative 2		Acres (%) Suitable for Grazing under Forage Reserve Alternative 3		Acres (%) Suitable for Grazing under Preferred Alternative Alternative 4	
	Grazing	Trailing	Sheep	Cattle	Sheep	Cattle	Sheep	Cattle
Alpine	49,343 (30)	0	16,057 (33)	14,669 (29)	8,855 (18)	1,459 (3)	7,471 (15)	975 (2)
Aspen	2,353 (1)	46 (12)	1,680 (71)	1,299 (55)	1,640 (70)	65 (3)	1,616 (69)	1,257 (53)
Aspen with Conifer	9,135 (6)	6 (2)	4,836 (53)	3,690 (40)	3,127 (34)	984 (11)	2,749 (30)	2,135 (23)
Barren Rock/Soil	3,851 (2)	3 (<1)	140 (4)	101 (3)	61 (2)	<1 (<1)	27 (1)	2 (<1)
Cool-moist Mixed Conifer	7,563 (5)	<1 (<1)	1,081 (14)	769 (10)	406 (5)	200 (3)	375 (5)	305 (4)
Mountain Grasslands	7,548 (5)	36	4,245 (55)	3,871 (6)	3,451 (39)	601 (8)	3,365 (30)	2,688 (6)
Mountain Shrublands	5,048 (3)	5 (1)	1,339 (27)	1,025 (20)	238 (5)	34 (<1)	191 (4)	133 (3)
Pinon-Juniper	<1 (<0.1)	3 (<1)	0	0	0	0	0	0
Ponderosa Pine	1,234 (1)	62 (16)	210 (17)	172 (14)	124 (10)	0	124 (10)	101 (8)
Riparian	3,087 (2)	22 (6)	1,344 (44)	1,309 (42)	421 (14)	172 (6)	245 (8)	82 (3)
Sagebrush	0	0	0	0	0	0	0	0
Spruce-fir	70,600 (43)	132 (35)	26,408 (37)	22,593 (32)	12,994 (18)	4,072 (6)	11,217 (16)	5,942 (8)
Warm-dry Mixed Conifer	1,968 (1)	37 (10)	671 (34)	454 (23)	226 (12)	<1 (<1)	221 (11)	110 (6)
Water	843 (<1)	26 (7)	5 (<1)	4 (<1)	2 (<1)	0	2 (<1)	2 (<1)
Total Acres	162,573	378	58,019 (36%)	49,995 (31%)	31,547 (19%)	7,589 (5%)	27,602 (17%)	13,733 (8%)

The wildlife habitat type with the most acres considered suitable for domestic sheep and cattle grazing in the Weminuche Landscape is spruce-fir forest. Overall, about half (46%) of the acres considered suitable for livestock grazing (26,408 acres) in the Weminuche Landscape are

comprised of spruce-fir forests. Under current management, about 37% of all spruce-fir forests in the Landscape are considered suitable for grazing by domestic livestock. Under Alternative 3 about 18% of all spruce-fir forests in the Landscape would be suitable for livestock grazing. Under the preferred alternative (Alternative 4), about 16% of spruce-fir forests would be suitable for livestock grazing. Therefore compared to current management (Alternative 2), Alternative 3 would reduce the amount of spruce-fir forests in the Landscape available for livestock grazing by 19% compared to Alternative 2. The preferred alternative (Alternative 4) would reduce it by an additional 2% compared to Alternative 3.

The spruce-fir forest type is generally found between 9,000 feet and 12,000 feet elevation. These forests are dominated by a varying mixture of Engelmann spruce and subalpine fir trees. In mature stands, these forests generally display high tree densities and closed canopy covers, which limits forage production on the forest floor. In the Weminuche Landscape however, most spruce-fir stands (85%) have moderate to low canopy cover and therefore tend to have higher forage production on the forest floor. In this Landscape, 66% of spruce-fir forests have moderate tree densities with canopy closures of 40-70%, and an additional 19% of spruce-fir stands have low canopy closures (less than 40%). Many of the spruce-fir stands with moderate to low canopy cover were created by timber harvests from the late 1960's through early 1990's. These previously harvested stands provide most of the spruce-fir forest acres considered suitable for livestock grazing in the Landscape.

Domestic sheep often pass through krummholz scattered in the alpine zone. Krummholz, which is dominated by dwarfed conifers (mostly spruce) and herbaceous species, is a transition type that occurs between spruce-fir forests of the subalpine zone and the treeless alpine zone. Sheep foraging in this type is relatively minor. Cattle grazing can occur in this type when it is in close proximity to parks. Current species composition and distribution in this type are likely similar to conditions found during the reference period (see EIS section 3.3, vegetation).

Sheep also pass through mature spruce fir stands on their way to and from alpine pastures. However, sheep prefer to spend as little time as possible in dense stands of spruce fir forest because of the generally poor forage conditions under closed-canopy stands. In general, cattle also spend little time in mature spruce-fir stands because of the lack of forage under closed canopy stands. Usually, cattle impacts in closed canopy conifer forests are small in scale and limited in scope as livestock rest near the edges of parks or travel along well-worn trails between adjacent parks or to nearby water sources. See the cumulative effects section below for a discussion about the ongoing spruce bark beetle epidemic and its potential impact on spruce-fir habitat conditions for sensitive species.

Domestic sheep spend much of their time in the alpine zone (28% of suitable grazing acres in the Landscape), with minor amounts of time spent in mountain grasslands (about 7% of suitable acres in Landscape), and passing through aspen forests (about 3% of suitable acres in Landscape) and aspen forests mixed with conifer (about 8% of suitable acres in Landscape) on their way to and from alpine pastures. About 44% of riparian habitats in the Landscape are considered suitable for sheep grazing under current management (Alternative 2), compared to 14% under Alternative 3 and 8% under the preferred alternative (Alternative 4).

Overall, about one third (28%) of the acres considered suitable for livestock grazing in the Weminuche Landscape (16,057 acres) are comprised of alpine habitats. Under current management, about 33% of all alpine habitats in the Landscape are considered suitable for grazing by domestic sheep. Under the allotment configuration of Alternative 3, about 18% (8,855 acres) of all alpine habitats in the Landscape would be suitable for sheep grazing. Under the allotment configuration of the preferred alternative (Alternative 4), only about 15% (7,471 acres) of alpine habitats would be suitable for sheep grazing. Therefore compared to current management,

the preferred alternative (Alternative 4) would reduce the amount of alpine habitats in the Weminuche Landscape considered suitable for livestock grazing by 18%.

Sheep obtain most of their forage in the alpine zone and spend most of their time in the alpine zone, although they pass through other habitat types to reach the alpine zone. Cattle however, spend little time and obtain little forage in alpine habitats. Alpine habitats are also potentially the most sensitive habitats to livestock grazing because of their very short annual growing seasons, harsh environmental conditions, frequently shallow soils, and often long time span for vegetation recovery. For these same reasons, wildlife species whose primary habitats occur in the alpine zone have the potential to be significantly affected by livestock grazing impacts in alpine habitats.

Alpine vegetation can best be described as a mosaic of many small plant communities that subtly intergrade with each other (Hoffman 2006). Alpine environments are among the most rigorous in the world. The extreme topographic relief and weather conditions typical of Colorado's alpine zone create an environment that is hostile to plant development. Within the alpine zone of the Weminuche Landscape there are four general alpine vegetation types: fellfield, turf, riparian-wetland, and dwarf willow. Other noteworthy but relatively minor vegetation types in this landscape include a tall willow type on mountain side slopes, and a talus type.

The alpine fellfield type occurs on harsh, wind-swept sites with shallow, rocky, well drained soils. Surface rock (gravel and cobble) and patches of bare soil are common. It is dominated by short cushion plants (forbs) often with a relatively low canopy cover. In the Weminuche Landscape, the fellfield type commonly occurs as small patches mixed within the matrix of the alpine avens turf type.

The dwarf willow alpine type is dominated by both snow willow (*Salix nivalis*) and alpine willow (*Salix petrophila*). Both are small, prostrate-growing plants that occur in separate or mixed patches. This type occurs on relatively dry protected sites on well drained, shallow soils (less than 20 inches to bedrock), moderately steep slopes, and northerly aspects, and where surface rock and patches of bare soil are common.

Sheep foraging in the dwarf willow and fellfield types is minor because the dominant plants that occur there are not preferred forage species. Current species composition and distribution in both types are likely similar to conditions found during the reference period. Effects from sheep trailing and trampling (sloughing, sheet erosion) however can be substantial in the fragile soils of these vegetation types. Cattle grazing effects can occur locally where dwarf willows occur in or adjacent to parks and spruce-fir stands. Cattle typically avoid fellfield types.

The third alpine vegetation type, the turf type, occurs on protected sites away from excessive wind and tends to have relatively deep (greater than 20 inches to bedrock), moist, moderately well developed soils. It is dominated by forbs and grasses, and usually displays a relatively high canopy cover. There are a number of distinct community types within the turf type of the Weminuche landscape, including an alpine avens type, a *Kobresia myosuroides* type, and a Parry rush type. The most common is the alpine avens type in which alpine avens is the dominant or co-dominant species. Small patches or individual willows also occur in this type.

Sheep foraging is heavy in the alpine avens type because many of the common plants are preferred forage species. Alpine avens is not a preferred forage species until fall following a severe frost. Sites that have experienced heavy long-term sheep grazing display less diversity of preferred forage species, particularly of forbs. Sheep trailing and trampling (sloughing, sheet erosion) in this type are evident in some places, but they are generally minor due to the high density and canopy cover of plants that protects the soils from hoof action. Most sheep trails visible today are likely

remnants of those created decades ago when sheep numbers and grazing intensity were much higher than recent years.

Sheep bedgrounds commonly occur in the alpine avens type which results in sheep spending significant amounts of time there, including multiple consecutive days, year after year. In some places in the Weminuche landscape this pattern of past domestic sheep use resulted in overgrazing leading to a decrease in forb species diversity, reduced forb vigor, and increased sheet erosion.

The fourth and final alpine vegetation type is the general riparian-wetland type. It occurs primarily on low-lying sites with poorly drained soils. This type contains high plant community diversity including tall willow shrublands that occur in wetlands and along riparian areas. A general riparian-wetland type may contain patches of multiple plant communities. Sheep browsing on both of the willows of this type (*Salix planifolia* and *Salix brachycarpa*) is heavy in some places and sheep readily forage on sedges and other plants found in this community.

A tall willow type found on mountain side slopes is associated with springs and/or sites with a heavy snowpack that extends late into the summer. It differs from the tall willows found in riparian zones by its better-drained soils and its upland landscape position. Sheep readily browse on both of the willows of this type, but *Salix planifolia* seems to be preferred. Most willow plants and plant communities are vigorous, but some heavy browsing was observed. It is not known how much of the browsing observed was due to elk using the same areas, and how much was due to domestic sheep grazing. Some sheep trailing is evident in this vegetation type, however, current species composition and distribution are likely similar to conditions found during the reference period.

General Impacts of Livestock Grazing:

In general, effects of livestock grazing on wildlife species and habitats may result from the direct competition between livestock and wildlife for food or cover. Other effects may result from the short- or long-term reduction in habitat quality or capability, or reduced habitat effectiveness, potentially affecting breeding and foraging habitats, and habitats used by primary prey species such as insects and small mammals. A potential negative effect of grazing activities is browsing impacts to upland willows of moderate to low stature, reducing hiding cover and food availability for wildlife or the primary prey species on which they depend.

Operational activities by livestock permittees such as fence construction and replacement, construction or maintenance of water developments, and managing livestock distribution can also affect wildlife habitats. In most cases, construction or replacement of fences and construction or maintenance of water developments may require the removal of very small amounts of grassland, shrub, or forested vegetation at small and localized scales. For these reasons, no measureable negative effects to wildlife habitats are expected from these typically small scale livestock management activities. Although vegetation removal can result in small losses of wildlife habitat, these projects can also provide some benefit to wildlife by mitigating grazing impacts such as reducing the timing and extent livestock graze in and near primary rangelands.

Moving livestock from pasture to pasture or across allotments may cause minor disturbance to individual animals, temporarily displacing individuals, such as with the use of domestic sheep herding and protection dogs. In some localized areas, repetitive use of certain routes by livestock can reduce wildlife habitat capability, but such disturbances typically occur at very small scales and last for a very limited duration of time. Invasive species such as noxious weeds may be introduced during all livestock management activities and weeds may expand into previously disturbed and undisturbed areas, potentially negatively affecting forage quantity and quality for wildlife and/or their primary prey.

Based on the considerations described above, sensitive species associated with grassland, shrubland and riparian/wetland habitats, and forested species that prefer more open stand conditions are expected to have greater potential to be affected by livestock grazing activities. The reduction or alteration of grassland, shrubland, or riparian/wetland habitats has potential to negatively affect sensitive species associated with these habitats, and/or their primary prey. Generally, less habitat impacts are expected under rest rotation grazing systems, followed by deferred rotation systems, and more traditional rotation systems. Generally, sensitive species associated with dense mixed conifer and spruce-fir forests are less likely to be affected by livestock grazing activities due to the general dislike of these habitats by cattle and sheep, and generally minimal overlap of grazing activities with habitats used by these species.

There are a variety of operational strategies used in managing livestock in the Weminuche Landscape. Some livestock, both cattle and sheep, are trailed to designated allotments, while others are transported by truck. In some instances, range improvement projects are conducted to manage and improve livestock distribution, such as the construction of fencing (brush, wire, and pole), and water developments (spring development, stock ponds, and reservoirs) and associated maintenance, and salting, range riding, and domestic sheep herding and protection dogs.

Converting the class of livestock from domestic sheep to cattle has the potential to increase effects to some wildlife habitats. This is because cattle tend to spend more time than sheep within spruce-fir and aspen forests, especially along the margins of parks and near water sources where they often rest during the heat of the day. Cattle also have a greater tendency to create well defined regular use trails through closed-canopy forest stands as they travel to adjacent parks and water sources. Cattle also have the potential for somewhat greater impacts than sheep in riparian areas, especially in areas where they congregate and lounge near preferred water sources. Woody riparian vegetation such as willows, may be negatively affected by the physical action of cattle moving through and around willow stands, and also by browsing on the plants themselves. In comparison, domestic sheep tend to spend less time than cattle within and immediately adjacent to riparian areas and water sources.

Converting the class of livestock from domestic sheep to cattle has the potential to decrease effects to some wildlife habitats and species. This is because cattle spend little time in the alpine zone whereas sheep spend much of their summer grazing season in or enroute to the alpine zone where they obtain most of their forage. Therefore converting the class of livestock from sheep to cattle has the potential to decrease livestock grazing effects to sensitive species associated with alpine habitats.

The few structural improvements in the Weminuche Landscape are principally related to converting existing sheep allotments to cattle allotments, and would be in the form of new and/or improved fences necessary to implement an effective cattle 3-pasture rotation grazing system, and maintenance/installation of some water sources. Under the preferred alternative of the EIS (Alternative 4), about 22.9 miles of new fence construction is thought to be necessary among the five proposed cattle allotments (Burnt Timber, Canyon Creek, Endlich Mesa, Spring Gulch, and Tank Creek). These new fences would be necessary to create an effective rotation system within the allotment or as allotments are combined with adjacent allotments, or to provide effective divisions between neighboring cattle allotments.

The 22.9 miles of potential new fence could result in the loss of about 27.8 acres of wildlife habitats in the analysis area. However, because fence lines are typically narrow corridors less than 10 feet in width that are not barriers to wildlife movements, it is unlikely that the 27.8 acres of habitat disturbed by new fence construction would be lost to wildlife use. For this reason, the 22.9 miles of new fence construction is unlikely to alter the amount of habitat available to sensitive

species or affect the manner in which sensitive species are distributed within and among the allotments. This amount of habitat disturbance is very small compared to the generally large amounts of sensitive species habitats within these five allotments and therefore this activity is unlikely to affect the numbers or distribution of sensitive species or the amount of habitat available for sensitive species in the Weminuche Landscape.

Repetitive use of certain routes by livestock can create non-system trails that may encourage public use, causing additional wildlife disturbance. The trailing across hillsides seen in some allotments is likely a function of historic sheep grazing practices, but new trails are unlikely to be created under current grazing practices. Invasive species such as noxious weeds may be introduced during any livestock associated management activity or may expand into previously undisturbed areas, affecting wildlife forage quantity and quality.

For all three action Alternatives, direct and indirect effects are expected to be mostly short-term. Long-term effects are associated with permanent structures such as fences, livestock created trails, and establishment and/or expansion of noxious weeds. Forest Plan Standards and Guidelines, design criteria, and adaptive management actions are included to address many of these effects to reduce impacts to habitat, wildlife, and other resources.

Vegetation Condition Monitoring:

Examination of the body of available data reveals that, for the project area at the overall landscape level, vegetative conditions are meeting desired conditions (94% of the data points; see sections 3.2 Soil and Water, and 3.3 Vegetation of the EIS). There are areas of concern however, specifically at bed grounds and trailing “choke points.” These areas of concern are generally limited in scale and localized in their extent. Many of these areas of concern are due to management practices from decades past when sheep stocking rates and intensity of use were much higher than under current management practices. For example, evidence of sheep trails that were created decades ago can still be seen in some areas. The management practices that created these conditions changed many years ago but evidence of their use still remains in some places.

Table 5, below, and Figure 2 (at the end of the document) display the results of vegetation monitoring sampling conducted in the Weminuche Landscape, primarily during the 2010, 2011 and 2012 field seasons. In Table 5 (below), points in black text and in blue text were meeting the project’s desired conditions; points in red text were not meeting the project’s desired conditions. Due to limited monitoring resources, the inter-disciplinary team conducted vegetation monitoring only in those allotments that would be open to livestock grazing under Alternative 3 or Alternative 4.

A total of 53 vegetation monitoring points were sampled across 11 of the 13 livestock allotments in the Weminuche Landscape. No monitoring points were conducted in the Flint Creek or Fall Creek Allotments because these two allotments are proposed to be closed under Alternatives 3 and 4.

Of the 53 vegetation monitoring points, a total of 38 (72%) were upland monitoring points and 15 (28%) were riparian monitoring points. All 38 upland monitoring points were rangeland health matrix (RHM) samples, and all 15 riparian monitoring points were proper functioning condition (PFC) samples.

Of the 53 monitoring points, 50 (94%) met the project’s desired conditions, and 3 (6%) did not. Of the 50 points that met the project’s desired conditions, 44 (88%) were rated “Healthy” with a “Stable” trend, and 6 (12%) were rated “At Risk” with an “Upward” trend (5 upland points, and 1 riparian point). All six points that were rated “At Risk” with an “Upward” trend met the project’s

desired conditions because, although in need of improvement, their condition was judged to be getting better over time and progressing toward those expected for their particular site. The three monitoring points (6%) that did not meet the project's desired conditions were an upland point in Canyon Creek Allotment (healthy with a downward trend), an upland point in Canyon Creek Allotment (At Risk with a downward trend), and a riparian point in Virginia Gulch Allotment (At Risk with an unapparent trend).

Table 5. Weminuche Landscape vegetation sampling points and results.

Allotment	Sample Site	Vegetation Type	Sample Type*	Results, Trend*
Burnt Timber	BT-RHM1	Mt Grassland	RHM	Healthy, Stable
	BT-RHM2	Aspen with Conifer	RHM	At Risk, Upward
	BT-RHM3	Spruce-fir	RHM	Healthy, Stable
Canyon Creek	CC-RHM1	Aspen with Conifer	RHM	Healthy, Stable
	CC-RHM2	Spruce-fir	RHM	Healthy, Stable
	CC-RHM3	Spruce-fir	RHM	Healthy, Stable
	CC-RHM4	Aspen with Conifer	RHM	Healthy, Downward
	CC-RHM5	Mt Grassland	RHM	At Risk, Downward
	CC-PFC1	Riparian/Spruce-fir	PFC	PFC, Stable
Cave Basin	CB-RHM1	Alpine	RHM	Healthy, Stable
	CB-RHM2	Cool-moist Mixed-conifer	RHM	Healthy, Stable
Endlich Mesa	ESM-RHM1	Mt Grassland	RHM	Healthy, Stable
	ESM-RHM2	Spruce-fir	RHM	Healthy, Stable
	ESM-RHM3	Spruce-fir	RHM	Healthy, Stable
	ESM-RHM4	Spruce-fir	RHM	At Risk, Upward
	ESM-RHM5	Mt Grassland	RHM	Healthy, Stable
	ESM-RHM6	Alpine	RHM	Healthy, Stable
	ESM-RHM7	Alpine	RHM	Healthy, Stable
	ESM-PFC1	Riparian/Spruce-fir	PFC	PFC, Stable
	ESM-PFC2	Riparian/Willows	PFC	At Risk, Upward
Johnson Creek	JC-RHM1	Spruce-fir	RHM	Healthy, Stable
	JC-PFC1	Riparian/Spruce-fir	PFC	PFC, Stable
Leviathan	LE-RHM1	Aspen/Spruce-fir	RHM	Healthy, Upward
	LE-PFC1	Riparian/Spruce-fir	PFC	PFC, Stable
Pine River	PR-PFC1	Riparian/Grassland	PFC	PFC, Stable
Rock Creek	RC-RHM1	Spruce-fir	RHM	Healthy, Stable
	RC-PFC1	Riparian/Willows	PFC	PFC, Stable
	RC-PFC2	Riparian/Spruce-fir	PFC	PFC, Stable
Spring Gulch	SG-RHM1	Aspen	RHM	Healthy, Stable
	SG-RHM2	Aspen	RHM	Healthy, Stable
Tank Creek	TC-RHM1	Mt Grassland	RHM	Healthy, Stable
	TC-RHM2	Alpine	RHM	Healthy, Stable
	TC-RHM3	Spruce-fir	RHM	Healthy, Stable
	TC-RHM4	Alpine	RHM	Healthy, Stable
	TC-RHM5	Alpine	RHM	Healthy, Stable
	TC-RHM6	Spruce-fir	RHM	Healthy, Stable
	TC-RHM7	Spruce-fir	RHM	At Risk, Upward

Allotment	Sample Site	Vegetation Type	Sample Type*	Results, Trend*
	TC-PFC1	Riparian/Alpine	PFC	PFC, Stable
	TC-PFC2	Riparian/Alpine	PFC	PFC, Stable
	TC-PFC3	Riparian/Alpine	PFC	PFC, Stable
Virginia Gulch	VG-RHM1	Alpine	RHM	Healthy, Stable
	VG-RHM2	Mt Grassland	RHM	Healthy, Stable
	VG-RHM3	Alpine	RHM	Healthy, Stable
	VG-RHM4	Alpine	RHM	Healthy, Stable
	VG-RHM5	Alpine	RHM	At Risk, Upward
	VG-RHM6	Mt Grassland	RHM	Healthy, Stable
	VG-RHM7	Alpine	RHM	Healthy, Stable
	VG-RHM8	Alpine	RHM	Healthy, Stable
	VG-RHM9	Alpine	RHM	At Risk, Upward
	VG-PFC1	Riparian/Willow	PFC	At Risk, No Trend Apparent
	VG-PFC2	Riparian/Grassland	PFC	PFC, Stable
	VG-PFC3	Riparian/Grassland	PFC	PFC, Stable
	VG-PFC4	Riparian/Alpine	PFC	PFC, Stable

~Active allotments are shaded in the table, vacant allotments are unshaded~

*Sample Type:

- RHM = Rangeland Health Matrix.
- PFC = Riparian Proper Functioning Condition.

*Results:

- Meeting = Healthy, or, **At Risk with Upward trend**;
- Not Meeting = **Unhealthy, or, At Risk with No Trend Apparent**.

SPECIES CONSIDERED

The following tables list terrestrial wildlife species considered in this report, a summary of how the project may affect each species and their key habitat components, and affect/impact determinations for each species. Potential affects to sensitive fish species were analyzed in a separate document and will not be reviewed here. Specific project affects or impacts are discussed in more detail for those species with habitat present in the project area and that are likely to be affected (positively or negatively) by the preferred alternative.

The process used to evaluate the potential effects the preferred alternative could have on threatened, endangered, or sensitive species on NFS lands is described in Forest Service Manual direction FSM 2672.4 – biological evaluations.

BIOLOGICAL EVALUATION FOR SENSITIVE SPECIES

Table 6, below, lists the species designated as Sensitive by the USFS Rocky Mountain Regional Forester (USDA Forest Service 2015) that are known to occur, may occur, or have habitat on NFS lands managed by the San Juan National Forest. Table 6 also provides a summary of how the preferred alternative (Alternative 4) might affect each species and their key habitat components, and impact determinations for each species. Specific project impacts are discussed in more detail

for those species with habitat present in the Weminuche Landscape and that are likely to be affected (positively or negatively) by the action alternatives.

There are 31 species identified as sensitive on the Region 2 Sensitive Species list (USDA Forest Service 2015). Some species are not present in the Weminuche Landscape due to the absence of suitable habitat, or, suitable habitat is present in the Landscape but the action alternatives (livestock grazing) would not affect the species or its key habitat components. Table 6, below, provides rationale for why some sensitive species were brought forward for detailed project analysis and other species were not.

Existing habitat for sensitive species was determined by the use of Geographical Information System (GIS) modeling using vegetative information described in Forest-wide MIS Assessments on National Forest System lands. Habitat modeling was conducted using habitat structural stage matrices described by Towry (1984). In addition, information on species' distribution across the Forest, professional judgment of Forest Service wildlife biologists, coordination with Colorado Parks and Wildlife (CPW) biologists, coordination with the U.S. Fish and Wildlife Service, and field reconnaissance of the project area was also used.

Information on the habitat requirements, status, distribution, abundance and key habitat components of USFS designated Sensitive Species is on file at the Columbine Ranger District office in Bayfield, Colorado and will not be reviewed here.

Table 6. Forest Service Region 2 Sensitive Terrestrial Wildlife Species list for the San Juan National Forest based on August 14, 2015 (FSM R2 Supplement 2600-2015-1).

Species	Habitat Present In Project Area (PA)? [Yes/No]	Species or Habitat Impacted by Project (Yes/No)?	Basic Habitat Description	Project Impact Determination
MAMMALS				
American marten	Yes – known to occur year round in Landscape. About 71,020 acres of habitat in Landscape, of which 34% is in areas suitable for grazing.	No - foraging habitat (closed canopy spruce-fir forests) generally not affected by sheep grazing	Mature spruce/fir and mixed conifer forests with complex physical structure.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on American marten. No further analysis is required
Desert Bighorn Sheep	No – no desert canyons in Landscape, not known to occur in San Juan, Hinsdale or La Plata County	No	Rocky canyons, grass, low shrub, open habitat with adjacent steep rocky areas for escape and safety. Might occur on Dolores RD; does not occur on Columbine or Pagosa RDs.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on desert bighorn sheep. No further discussion is required
Fringed myotis	No – Landscape too high in elevation, not known to occur in Landscape	No	Desert, grassland, and woodland habitats. Roosts in caves, mines, rock crevices, buildings, and other protected sites.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on Fringed myotis. No further discussion is required
Gunnison's prairie dog	No – no suitable extensive grassland or prairie dog colonies in Landscape not known to occur in San Juan or Hinsdale County	No	High mountain valleys and plateaus at 1830-3660 m; open or slightly brushy country, scattered junipers and pines. Burrows usually on slopes or in hummocks.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on Gunnison's prairie dog. No further discussion is required
Hoary Bat	No – Landscape too high in elevation, not known to occur in San Juan or	No	Associated with foliage in trees, mainly ponderosa pine,	Selecting Alternative 2, 3 or 4 will have “ no impact ” on hoary bat. No further

Species	Habitat Present In Project Area (PA)? [Yes/No]	Species or Habitat Impacted by Project (Yes/No)?	Basic Habitat Description	Project Impact Determination
	Hinsdale County		piñon/juniper and riparian forest.	discussion is required
North American wolverine	Yes – denning and foraging habitat present in Landscape, but not confirmed to occur in San Juan or Hinsdale counties in past 50 years		Yes – foraging habitat possibly affected by sheep grazing	Selecting Alternatives 2, 3 or 4 “may impact individual wolverines but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide” .
River Otter	Yes – known to occur in and near the main stem Pine River. About 121.9 miles of river habitat in Landscape.	No - alternatives will not alter aquatic habitat structure or primary prey abundance or distribution	Stream and river riparian	Selecting Alternative 2, 3 or 4 will have “no impact” on river otter. No further discussion is required
Rocky Mountain bighorn sheep	Yes – known to occur in Landscape year round. About 38,767 acres of mapped (CPW) summer range in Landscape.	Yes – potential for disease transmission with domestic sheep, and potential for forage competition	Open or semi-open habitats, often in precipitous terrain and the adjacent benches and mesa tops, most commonly in alpine, grassland, shrub-steppe and rocky areas.	Selecting Alternative 2, 3 or 4 “may impact individual bighorn sheep but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide” .
Spotted bat	No – too high elevation, not known to occur in San Juan Co.	No	Pinyon-juniper, shrub desert, possibly riparian.	Selecting Alternative 2, 3 or 4 will have “no impact” on spotted bat. No further discussion is required
Townsend’s big-eared bat	No – Landscape too high in elevation, no open dry forests	No	Forages in semi-desert shrublands, pinyon-juniper woodlands and open montane forests. Roosts in caves, mines and mature forests.	Selecting Alternative 2, 3 or 4 will have “no impact” on Townsend’s big-eared bat. No further discussion is required
BIRDS				
American bittern	No – no marsh, swamp, or bog with cattails, rushes, grasses, & sedges, not known to occur in San Juan or Hinsdale County	No	Marsh, swamp, or bog with cattails, rushes, grasses, & sedges	
American peregrine falcon	Yes – suitable foraging habitat, one nest known in the Landscape.	No –foraging habitat) generally not affected by sheep grazing	Cliff habitat over 200 feet high with suitable ledges for nest construction.	Selecting Alternative 2, 3 or 4 will have “no impact” on American peregrine falcon. No further analysis is required.
Bald eagle	Yes – suitable foraging habitat, one nest known just outside the Landscape.	No – foraging habitat generally not affected by sheep grazing.	Nests and roosts are usually found in open-branched trees near larger lakes, streams, rivers and reservoirs.	Selecting Alternative 2, 3 or 4 will have “no impact” on bald eagle. No further analysis is required.
Black swift	Yes – known to nest and forage in Landscape	No – nesting (waterfalls) and foraging habitat (in air above alpine peaks) not affected by sheep grazing	Nests behind or next to waterfalls and wet cliffs. Forages over forests and open areas.	Selecting Alternative 2, 3 or 4 will have “no impact” on black swift. No further analysis is required.
Boreal owl	Yes – known to nest and occur year round in the landscape. About 50,439 acres of habitat in Landscape, of which 37% is in areas suitable grazing.	No – nesting habitat (standing dead trees) and foraging habitat (closed canopy spruce-fir forests) generally not affected by sheep grazing	Mature spruce/fir and mixed conifer forested areas with preference for wet situations (bogs or streams) for foraging	Selecting Alternative 2, 3 or 4 will have “no impact” on boreal owl. No further analysis is required.
Brewer’s sparrow	No – no sagebrush in Landscape; not known to occur in San Juan or Hinsdale County	No	Strongly associated with sagebrush in areas with scattered shrubs and short grass; to lesser extent	Selecting Alternative 2, 3 or 4 will have “no impact” on Brewer’s sparrow. No further analysis is required.

Species	Habitat Present In Project Area (PA)? [Yes/No]	Species or Habitat Impacted by Project (Yes/No)?	Basic Habitat Description	Project Impact Determination
			in mountain mahogany, rabbit brush, and bunchgrass grasslands with shrubs or large openings in pinyon-juniper.	
Burrowing owl	No – no suitable extensive grassland or prairie dog colonies in Landscape not known to occur in San Juan, Hinsdale or La Plata County	No	Open grasslands associated with prairie dogs. Nests and roosts in burrows dug by mammals or other animals. Not known to occur on Columbine or Pagosa RDs.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on burrowing owl. No further analysis is required.
Columbian sharp-tailed grouse	No – no habitat in Landscape; not known to occur in San Juan, Hinsdale or La Plata County	No	Oak/service berry shrublands, often interspersed with sagebrush; aspen forests; irrigated pasture. Recently reintroduced near Dolores, not known to occur on Columbine or Pagosa RDs.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on Columbian sharp-tailed grouse. No further analysis is required.
Ferruginous hawk	No – no suitable extensive grassland or prairie dog colonies in Landscape; not known to occur in San Juan or Hinsdale County	No	Open grasslands and shrub steppe communities. Nests in tall trees or shrubs along streams or on steep slopes. Not known to nest on or near SJNF, but is winter visitor and can occur during non-breeding season.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on ferruginous hawk. No further analysis is required.
Flammulated owl	Yes – known to nest in the Landscape. About 16,744 acres of habitat in Landscape, of which 32% is in areas suitable for grazing.	No – nesting habitat (standing dead trees) and foraging habitat (mixed-conifer and ponderosa pine forests) generally not affected by sheep grazing	Depend on cavities for nesting, open forests for foraging, brush for roosting. Occupy open ponderosa pine or forests with similar features (dry montane conifer or aspen, with dense saplings).	Selecting Alternative 2, 3 or 4 will have “ no impact ” on flammulated owl. No further analysis is required.
Lewis’ woodpecker	No – no suitable mature ponderosa pine or gambel oak in Landscape, not known to occur in San Juan or Hinsdale County	No	Open pine forests, burnt over areas with snags and stumps, riparian and rural cottonwoods, and pinyon-juniper woodlands.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on Lewis’ woodpecker. No further analysis is required.
Loggerhead shrike	No – no sagebrush or thorn shrub habitats in Landscape, not known to occur in San Juan or Hinsdale County	No	Grassy pastures that are well grazed. Nests in shrubs or small trees, preferably thorny such as hawthorn.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on loggerhead shrike. No further analysis is required.
Northern goshawk	Yes – foraging and nesting habitat in Landscape, known to nest in the Landscape. About 64,855 acres of habitat in landscape, of which 35% is in areas suitable for grazing.	No – nesting habitat not affected, and, foraging habitat generally not affected by sheep grazing	Mature forest generalist, often found in mixed conifer/aspen stands.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on northern goshawk. No further analysis is required.
Northern harrier	No - no suitable wetlands or cattail marshes in	No	Marshes, meadows, grasslands, and	Selecting Alternative 2, 3 or 4 will have “ no impact ” on

Species	Habitat Present In Project Area (PA)? [Yes/No]	Species or Habitat Impacted by Project (Yes/No)?	Basic Habitat Description	Project Impact Determination
	Landscape, not known to nest in San Juan Hinsdale County		cultivated fields. Nests on the ground, commonly near low shrubs, in tall weeds or reeds, sometimes in bog; or on top of low bush above water, or on knoll of dry ground, or on higher shrubby ground near water, or on dry marsh vegetation.	northern harrier. No further analysis is required.
Olive-sided flycatcher	Yes – suitable nesting habitat in Landscape, known to nest in Landscape. About 21,129 acres of habitat in Landscape, of which 36% is in areas suitable for grazing.	No – nesting habitat (large, live overstory conifer trees) and foraging habitat (aerial insects in tree canopy) generally not affected by sheep grazing	Mature spruce/fir or Douglas-fir forests with preference for natural clearings, bogs, stream and lake shores with water-killed trees, forest burns and logged areas with standing dead trees.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on olive-sided flycatcher. No further analysis is required.
Purple martin	No – no suitable mature aspen stands in Landscape, not known to nest in San Juan, Hinsdale or La Plata County	No	Mature pure aspen stands near streams, springs, or ponds. Breeds on Dolores RD. Not known to occur on Columbine or Pagosa RDs.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on purple marten. No further analysis is required.
Short-eared owl	No - no suitable wetlands or cattail marshes in Landscape, not known to nest in San Juan or Hinsdale County	No	Open habitats including grasslands, marsh edges, shrub-steppe, and agricultural lands; requires taller grass cover than Northern harrier	Selecting Alternative 2, 3 or 4 will have “ no impact ” on short-eared owl. No further analysis is required.
White-tailed ptarmigan	Yes- known to occur year round in Landscape. . About 48,200 acres of habitat in Landscape, of which 36% is in areas suitable for grazing.	Yes – nesting and foraging habitat (willows) shows evidence of localized impacts from sheep grazing	Alpine tundra, especially in rocky areas with sparse vegetation. Summer habitats include moist, low-growing alpine vegetation. Canopy cover of willow at winter feeding sites preferred.	Selecting Alternative 2, 3 or 4 “ may impact individual white-tailed ptarmigan but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide ”.
AMPHIBIANS				
Boreal toad	Yes – suitable habitat and one historic site in Landscape. Not known to currently occur in Landscape. About 3,567 acres of potential habitat in Landscape, of which 46% is in areas suitable for grazing.	No – no evidence that sheep grazing is substantially altering aquatic habitat structure	Wetlands in spruce/fir forest, near water and alpine meadows.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on boreal toad. No further analysis is required.
Northern leopard frog	Yes – possibly occurs at lowest elevations of Landscape. About 3,567 acres of habitat in Landscape, of which 46% is in areas suitable for grazing.	No – no evidence that sheep grazing is substantially altering aquatic habitat structure	Riparian and wetland areas.	Selecting Alternative 2, 3 or 4 will have “ no impact ” on northern leopard frog. No further analysis is required.
INSECTS				
Great Basin silverspot	No – Landscape is too high in elevation, not known to	No	Spring fed and/or subirrigated wetlands	Selecting Alternative 2, 3 or 4 will have “ no impact ” on great

Species	Habitat Present In Project Area (PA)? [Yes/No]	Species or Habitat Impacted by Project (Yes/No)?	Basic Habitat Description	Project Impact Determination
	occur in San Juan or Hinsdale County.		at low (7500 feet or less) elevation; larval food plant <i>Viola nephrophylla</i> ; wet meadows interspersed with willows and other woody wetland species; adult nectar sources (mostly composites).	basin silverspot. No further analysis is required.

DISCUSSION OF EFFECTS TO FOREST SERVICE SENSITIVE SPECIES

Of the 31 species designated as Sensitive by the USFS Rocky Mountain Region and that have potential to occur in the Weminuche Landscape or be affected by the preferred alternative, 14 have habitat and are known to occur or may occur in the Landscape. Of these 14 sensitive species that are known to occur or may occur in the Landscape, only three species have habitat present in the Weminuche Landscape and could be affected by livestock grazing. The three species brought forward for detailed analysis for this domestic sheep grazing project are white-tailed ptarmigan, North American wolverine and Rocky Mountain bighorn sheep.

The remaining 28 species either do not have habitat in the Weminuche Landscape, are not known to occur in the Landscape, do not regularly breed in or use the Landscape or occur only irregularly and unexpectedly and often outside of habitat associations characteristic of the species, or domestic livestock grazing is unlikely to substantially affect their preferred habitats or key habitat components. For these reasons, these 28 species will not be evaluated further and the effect of selecting any of the project Alternatives on these 28 species is “no effect”.

Sensitive Species with habitat in the analysis area but not affected by the action Alternatives (see Table 6, above):

Of the 31 species designated as Sensitive by the USFS Rocky Mountain Region and that have potential to occur in the Weminuche Landscape or be affected by the preferred alternative, 11 may occur in the Landscape but their key habitat components do not appear to be affected by domestic sheep or cattle grazing in the Weminuche Landscape. These 11 species include: American marten, American peregrine falcon, bald eagle, black swift, boreal owl, boreal toad, flammulated owl, northern goshawk, olive-sided flycatcher, river otter and northern leopard frog. Because no direct or indirect effects are expected to these species from domestic sheep grazing in the Weminuche Landscape, by definition there also are no cumulative effects.

American peregrine falcon nests on ledges near the top of cliff faces that have commanding views over the surrounding terrain (Craig and Enderson 2004). There is one known nesting site in the Landscape that has a long history of productivity. Suitable foraging habitat (open habitats, often near water) is extensive throughout the Landscape for this wide ranging species. Peregrine foraging habitat does not appear to be affected in this Landscape by sheep grazing to the level that would affect abundance of primary avian prey species, or affect peregrine productivity or survivorship. For these reasons, selecting any of the project Alternatives would have “no impact” on American peregrine falcon.

Black swift is known to nest at two locations in the Weminuche Landscape (pers. obs.). Swifts nest on cliff ledges at waterfalls, usually within the spray zone or behind the falling curtains of water (Wiggins 2004). Swifts forage for flying insects, especially winged ants, usually at great heights

above the surrounding alpine peaks and often at great distances from their nest sites (Wiggins 2004, Boyle 1998, Knorr 1993, Knorr 1961). For these reasons, sheep grazing does not affect swift nest sites or foraging opportunities for this wide ranging alpine species. Selecting any of the project Alternatives would have “no impact” on nesting or foraging habitats for black swift.

Boreal Owl is a small forest owl that has been found to be a relatively abundant and widely distributed year round resident across the San Juan National Forest and Weminuche Landscape in suitable mature spruce-fir forest habitat (Schultz 1999, Ryder 1998). It is an obligate secondary cavity nester, foraging primarily on southern red-backed voles captured on the ground in closed canopy mature forests (San Juan National Forest 2004a, Hayward et. al. 1993). There is about 50,640 acres of boreal owl habitat in the Landscape, of which about 18,545 acres (37%) is suitable for sheep grazing under current management (Alternative 2). About 7,566 acres (15%) of owl habitat would be in areas suitable for livestock grazing under Alternative 3. About 6,526 acres (13%) of owl habitat would be in areas suitable for livestock grazing under Alternative 4, the preferred alternative. Nest cavity trees are not likely to be affected by grazing activities, and sheep and cattle tend to spend little time in mature spruce-fir forests because of the lack of forage under closed canopy conifer forests. Construction of new fences would not alter the abundance of red-backed voles, their primary prey, and the potential for loss of a very small number of nest cavity snags to linear fence construction activities is unlikely to alter habitat capability for owls in any substantive way. For these reasons, selecting any of the project Alternatives would have “no impact” on the key nesting and foraging habitat components for boreal owl.

Flammulated owl is a summer resident known to breed in mature forests of aspen mixed with conifer across the Landscape. This small forest owl has been found to be a relatively abundant and widely distributed breeding species across the Landscape in suitable habitat (pers. obs.). It is an obligate secondary cavity nester, foraging primarily on large moth species captured in flight under closed canopy mature forests (San Juan National Forest. 2004b, Reynolds and Linkhart 1992). There is about 17,227 acres of flammulated owl habitat in the Landscape, of which about 5,371 acres (31%) is suitable for sheep grazing under current management (Alternative 2). About 3,290 acres (19%) of owl habitat would be in areas suitable for livestock grazing under Alternative 3. About 3,087 acres (18%) of owl habitat would be in areas suitable for livestock grazing under Alternative 4, the preferred alternative. Nest cavity trees are not likely to be affected by livestock grazing activities. Domestic sheep generally move through mature forest stands relatively rapidly on their way to preferred higher elevation foraging areas. No areas were found in the Landscape where sheep grazing activities were thought to be potentially affecting abundance of this owl's primary insect prey. Construction of new fences and the potential for loss of a very small number of nest cavity trees and snags to linear fence construction activities is unlikely to alter habitat capability for owls in any substantive way. For these reasons, selecting any of the project Alternatives would have “no impact” on the nesting habitat or foraging habitat for flammulated owl.

Northern goshawk is known to breed in mature forests of conifer and aspen mixed with conifer across the Landscape (San Juan National Forest 2004c). This large forest raptor has been found to be relatively widely distributed across the Landscape, although usually at relatively low density and often irregular in occurrence even in suitable habitat (pers. obs.). Goshawks nest in moderate size stick platform nests located just below the primary forest canopy, often near forest openings (Kennedy 2003). Goshawks forage for a wide variety of small to medium sized mammal and bird species, usually capturing them on the ground after short pursuit flights. The primary limiting factor on goshawk populations in the southern Rocky Mountains is thought to be prey abundance (Kennedy 2003).

There is about 65,360 acres of northern goshawk habitat in the Weminuche Landscape, of which about 23,141 acres (35%) is in areas suitable for sheep grazing under current management

(Alternative 2). About 10,170 acres (16%) of goshawk habitat would be in areas suitable for livestock grazing under Alternative 3. About 8,936 acres (14%) of goshawk habitat would be in areas suitable for livestock grazing under Alternative 4, the preferred alternative. Domestic sheep generally move through mature forest stands relatively rapidly on their way to preferred higher elevation foraging areas. Goshawk foraging habitat in the Landscape does not appear to be affected by sheep or cattle grazing to the level that would affect abundance of primary avian or mammal prey species, or affect goshawk survivorship or productivity. Construction of new fences would not alter the abundance of goshawk primary prey, and the potential for loss of a very small number of potential nest trees to linear fence construction activities is unlikely to alter goshawk habitat capability in any substantive way. For these reasons, selecting any of the project Alternatives would have “no impact” on northern goshawk.

Olive-sided flycatcher is a summer resident known to breed in mature spruce-fir and cool-moist mixed-conifer forests across the Landscape (Jones 1998). This neotropical migratory bird is a widely distributed breeding species across the Landscape in suitable habitat, but its populations have declined significantly (50% decline over past 30 years) across its continental breeding range (Rich et. al. 2004). This flycatcher nests in the outer canopy of live mature conifer trees and forages on flying insects caught in flight over forest openings (San Juan National Forest 2004d, Jones 1998). There is about 21,929 acres of flycatcher habitat in the Landscape, of which about 7,681 acres (35%) is suitable for sheep grazing under current management (Alternative 2). About 4,527 acres (21%) of flycatcher habitat would be in areas suitable for livestock grazing under Alternative 3. About 3,930 acres (18%) of flycatcher habitat would be in areas suitable for livestock grazing under Alternative 4, the preferred alternative. Live overstory conifer nest trees are not affected by sheep or cattle grazing activities. Construction of new fences would not substantively alter the abundance or distribution of potential overstory nest trees. No areas were found in the Landscape where livestock grazing activities were thought to be potentially affecting abundance of large flying insect prey (San Juan National Forest 2004d). For these reasons, selecting any of the project Alternatives would have “no impact” on the nesting habitat or foraging habitat for olive-sided flycatcher.

Northern leopard frogs are a relatively common and widespread breeding species at lower elevations, occurring near and south of the Weminuche Landscape, but have not been confirmed to occur within the Landscape (San Juan National Forest 2004e). There is one boreal toad historic breeding site in the Landscape but surveys over the past 15 years have failed to find evidence of toad occupancy. This historic site is assumed to be currently vacant. Apparently suitable shallow permanent wetlands (Hammerson 1999) occur in the Landscape. There is about 3,639 acres of shallow wetlands in the Landscape, of which 1,636 acres (45%) occur in active or vacant sheep allotments under current management (Alternative 2). About 599 acres of wetlands (16%) would be in active or forage reserve allotments under Alternative 3. About 411 acres (11%) of wetlands would be in active allotments under Alternative 4, the preferred alternative. Monitoring visits did not find evidence that sheep or cattle grazing is substantially altering the habitat structure of shallow permanent wetlands such that water quality would be degraded or trampling of individual frogs or toads or hiding cover in surrounding upland areas would be a concern (San Juan National Forest 2004e). Construction of new fences is unlikely to occur within or across shallow wetlands and thus linear fence construction activities are unlikely to alter habitat capability for frogs and toads in any substantive way. For these reasons, selecting any of the project Alternatives would have “no impact” on northern leopard frog and boreal toad.

American marten is a year round resident in mature spruce-fir forests across the Weminuche Landscape (San Juan National Forest 2004f). Winter track monitoring has shown marten to be a relatively widespread and reasonable abundant species across the Landscape in suitable habitat (San Juan National Forest 2004g). This medium sized member of the weasel family forages

primarily on red squirrels and other small mammals in the canopy of mature spruce-fir forests and on the forest floor (San Juan National Forest 2004f and g). There is about 71,780 acres of marten habitat in the Landscape, of which about 24,236 acres (34%) is suitable for sheep grazing under current management (Alternative 2). About 10,863 acres (15%) of marten habitat would be in areas suitable for livestock grazing under Alternative 3. About 9,586 acres (13%) of marten habitat would be in areas suitable for livestock grazing under Alternative 4. Overstory cone-bearing trees are not affected by grazing activities, and sheep and cattle tend to spend little time in mature spruce-fir forests because of the lack of forage under closed canopy conifer stands. Construction of new fences would not alter the abundance of red-backed voles or red squirrels, their primary prey. Marten foraging habitat in the Landscape does not appear to be affected by sheep or cattle grazing to the level that would affect abundance of their primary prey (San Juan National Forest 2004f). For these reasons, selecting any of the project Alternatives would have “no impact” on American marten.

Sensitive Species with habitat in the analysis area and possibly affected by the action Alternatives (see Table 6, above):

Of the 31 species designated as Sensitive by the USFS Rocky Mountain Region and that have the potential to occur in the Weminuche Landscape or be affected by the preferred alternative, three species have habitat present in the Weminuche Landscape and may be affected by domestic sheep grazing. The three species brought forward for additional analysis for this domestic sheep grazing project are white-tailed ptarmigan, North American wolverine and Rocky Mountain bighorn sheep.

White-tailed ptarmigan

White-tailed ptarmigan are endemic to alpine habitats of western North America, primarily at or above treeline. They also use riparian zones, meadows and willow carrs near treeline in the subalpine zone. Ptarmigan is one of only five bird species whose primary breeding habitat is the alpine zone above treeline. Alpine zones are among the most rigorous wildlife habitats in the world. In the Rocky Mountains, ptarmigan have a highly disjunct distribution, occurring at the highest elevations of mountain ranges that are often widely separated from adjacent ranges. Ptarmigan do not occur in Idaho, Oregon, California, or Utah, and may be extirpated from Wyoming. Colorado supports the largest population of ptarmigan and greatest expanse of suitable habitat in the United States outside of Alaska (Hoffman 2006). About 95 percent of occupied ptarmigan habitat in Colorado occurs on public lands, of which about 84 percent is administered by the USFS. Ptarmigan are legally hunted in Colorado, and some easily accessible ptarmigan populations may be vulnerable to over-harvest due to their unwary behavior and their habit of concentrating in large flocks in traditional use areas.

Individual adult ptarmigan have high site fidelity to preferred breeding and wintering areas (Hoffman 2006). The single most important feature of habitats used by ptarmigan in Colorado is willow (*Salix* spp.), which is their primary food source from late fall through spring. Any activity that reduces the distribution and abundance of willow will likely have negative consequences to ptarmigan (Hoffman 2006). In winter, willows growing on exposed ridge tops are usually less than 3 feet tall and are rarely covered by snow. These areas are consistently used as feeding sites by ptarmigan throughout the winter. Rangeland monitoring in the Weminuche Landscape showed these areas are also consistently used by domestic sheep throughout their permitted grazing season. During winter days, ptarmigan feed along exposed ridges on the tops of willow stems protruding above the snow surface, then at dusk move down to areas near treeline with deeper and softer snow where they can burrow beneath the surface for night roosts. Most preferred winter areas are at or near timberline in basins near the heads of drainages, meadows, and other areas of relatively gentle terrain at or near timberline. These same areas are also preferred grazing areas by

domestic sheep in mid-summer. For these reasons, there is direct overlap between ptarmigan winter feeding and roosting areas and domestic sheep grazing areas.

In winter, ptarmigan also feed and roost in areas dominated by willows growing near or just below treeline and along drainage basins (Hoffman 2006). Willows growing in these situations commonly reach heights of 6 to 9 feet tall. These tall willow areas are not used extensively by domestic sheep because of their typically wet soils, lack of forage, and the typically very dense structure of tall willow stands.

Female ptarmigan nest on the ground, generally in areas with moderate slopes that become snow-free by early June (Hoffman 2006). Most nests have some type of cover immediately adjacent to the nest, usually rocks or clumps of vegetation to provide a wind break. Eggs hatch from late June to early August, peaking in mid July at about the same time that domestic sheep are turned on to allotments in the Weminuche Landscape. Ptarmigan brood rearing is late July through late September, overlapping with most of the domestic sheep grazing season.

Brood-rearing areas for females and summering areas for post breeding males and unsuccessful females occur on high, rocky, windswept ridges, benches, and mountain tops (Hoffman 2006). These areas usually center on late-lying snow fields or other moist sites. The most important components of ptarmigan summer habitat are rocky areas for cover and in close proximity to lush herbaceous vegetation for food. These areas also provide significant amounts of suitable grazing areas for domestic sheep.

One Colorado study indicated that ptarmigan use of summer habitats may be influenced by the presence and intensity of domestic sheep grazing (Braun 1971). Ptarmigan continue to use summering areas into the fall until the first severe snowstorm forces them to move downhill to the upper edges of willow stands. Intensive sheep grazing in summer areas may force ptarmigan out of these preferred feeding areas and down into winter habitats early, potentially reducing availability of preferred foods on traditional wintering grounds. Field monitoring in active sheep allotments found areas where historic sheep grazing has left visible networks of livestock trails and terraces. Current sheep use has likely further inhibited the naturally slow revegetation of these trails, but in most cases does not appear to be causing additional erosion of existing trails, nor an increase in the number of trails.

In contrast to the localized impacts of sheep grazing, most active allotments showed numerous instances where recreation trails used by hikers and horses had exposed soils that appeared to be actively eroding due to human recreation impacts. These trails have often become trenched and parallel trails have developed, along with increasing impacts to adjacent willow and forb communities. In active allotments, sheep frequently use these same trails, and distinguishing between impacts to soils and vegetation due to recreation use versus sheep use was often not possible with certainty. In some areas, human recreation (including horses) appeared to be having greater impacts to soil and vegetation condition than sheep grazing. Many of the areas where these impacts were observed were also ptarmigan summer habitat.

White-tailed ptarmigan rely mostly on forbs and willows for food including buds, twigs, catkins, fruits, seeds, flowers, stems, leaves, and insects (Hoffman 2006). There is likely to be substantial forage overlap between ptarmigan and domestic sheep in some areas and during some seasons. Elk are also potential forage competitors with ptarmigan, and elk populations have increased dramatically over the past 50 years in Colorado and in the Weminuche Landscape. Elk use of alpine habitats has also increased dramatically, including in winter. In the Weminuche Landscape, the only forage available to elk wintering in alpine areas is willow on windswept ridgelines, the same areas preferred by ptarmigan in winter. Substantial browsing on upland willow communities was observed in many allotments, although the effects were usually restricted

to localized areas. It was often difficult to determine with certainty whether domestic sheep or elk, or a combination of both, were primarily responsible.

Ptarmigan populations in the southwest Colorado ore belt, roughly between Telluride, Silverton and Lake City are thought to not be self-sustaining. This area is immediately adjacent to the north of the Weminuche Landscape and may include small portions of the Landscape. Research by Larison et al. (2000) demonstrates that reduced over-winter survivorship of adult female ptarmigan caused by cadmium-induced renal failure and brittle bones is limiting ptarmigan breeding densities and productivity in this area. Cadmium naturally occurs in high concentrations in the Colorado ore belt and is readily mobilized by mining. Cadmium is taken up by willows and biomagnified in the buds which are the primary winter food source for ptarmigan (Hoffman 2006). Larison et al. (2000) found adult female survivorship in the southwest Colorado ore belt was reduced by more than half causing highly skewed sex ratios and low productivity. They also documented high rates of immigration (from nearby less contaminated populations) and the lowest breeding densities of any ptarmigan population throughout the species' range.

Because ptarmigan populations in this area may not be self-sustaining, protecting and maintaining winter habitat for adult female ptarmigan is likely to be a key factor in ensuring long-term population persistence in the Colorado Ore Belt and in the Weminuche Landscape. Maintenance and protection of winter habitat is especially important given the high site fidelity of wintering birds and the considerable numbers of adult females that are attracted from surrounding breeding habitats to the few suitable wintering sites (Braun et al. 1976). Ptarmigan populations may be especially vulnerable to loss or degradation of winter habitat given that population densities are much lower than other areas and may not be self-sustaining (Larison et al. 2000).

Direct and Indirect Effects

For other species of upland birds, the primary affect of grazing is the reduction in residual cover required for nesting (Hoffman 2006). For ptarmigan, the primary affect of sheep grazing is a reduction in food availability. Some of the most important foods identified in the diet of sheep on alpine ranges are clovers and bistorts, the same forbs that comprise a substantial percentage of the summer and fall diets of ptarmigan. One study showed alpine bistort alone comprised 54% of the summer diet of female ptarmigan. Sheep are turned on to allotments in the Weminuche Landscape in early July, during or shortly after the peak of ptarmigan hatch. Although newly hatched chicks are mainly consuming insects, they quickly shift their diet to plant matter similar to adult ptarmigan. Consequently, sheep are potentially in direct competition for food with all ptarmigan age and sex classes. This competition may be especially critical for young birds because it occurs at a time when certain foods are necessary to ensure proper growth (Hoffman 2006).

A significant additional potential affect of sheep grazing on ptarmigan habitat is browsing impacts to upland willows of moderate to low stature. Browsing on upland willows can have the effect of reducing ptarmigan food availability and hiding cover in brood rearing areas and summer/fall foraging areas. Some minor and localized browsing on upland willows was observed during monitoring field trips in all active sheep allotments in the Landscape. Unfortunately, it was not possible to determine with certainty whether browsing was due to domestic sheep, elk, or a combination of both. However, any activity, including sheep grazing, that negatively affects willows or reduces the abundance or species diversity of the forb community in areas used by ptarmigan during the summer and fall can negatively affect ptarmigan (Hoffman 2006). Those effects are likely magnified in this area because of the very low population densities of ptarmigan in this area and the dependence on birds immigrating from other areas to maintain local populations.

Historically, widespread and unregulated grazing of alpine areas by large numbers of domestic sheep probably posed the greatest threat to ptarmigan populations in the Weminuche Landscape. Over the last seven decades however, there has been a 62% to 94% decline in the total number of sheep grazed in the Weminuche Landscape and on the SJNF, respectively. This substantial reduction in numbers of permitted sheep from past levels on the SJNF (172,900 in 1940's, 10,800 currently) has likely allowed substantial recovery of alpine plant communities, resulting in a substantial improvement in ptarmigan habitat capability over the past 70 years (since 1940).

Alternative 1 –No Action

Selecting Alternative 1 would be entirely beneficial to white-tailed ptarmigan. Alternative 1 would provide gradual improvement in the condition of summer and fall foraging areas, but these improvements would likely be limited in scope because upland willow stands where browsing impacts were observed were localized and not widespread. In addition, the improvement in upland willow condition would be limited to only those areas where domestic sheep grazing was the primary browsing agent. Those stands where elk browsing is also a factor might not show improvement over time in the absence of domestic sheep grazing. The improvement in summer foraging areas likely to occur under Alternative 1 would also likely occur slowly over time because of the relatively short growing seasons in the alpine zone. The relatively small number of domestic sheep currently permitted to graze in the Weminuche Landscape (about 4,400), compared to decades past (about 11,500 in the 1940's), also suggests that the rate of improvement in ptarmigan foraging habitats is likely to be less today than in decades past when domestic sheep numbers declined much more rapidly.

Alternative 2 (Current Management):

Selecting Alternative 2 would be neutral for ptarmigan due to the relatively low numbers of domestic sheep, compared to past decades, would likely continue on the Landscape for the foreseeable future. Selecting Alternative 2 however, would be much less beneficial than selecting Alternative 1. There is about 49,343 acres of ptarmigan habitat in the Weminuche Landscape. Under Alternative 2 about 33% (16,057 acres) of ptarmigan habitat would be in areas suitable for domestic sheep grazing. Under Alternative 1, all ptarmigan habitat in the Landscape would be protected from impacts associated with domestic sheep grazing. Under Alternative 2, improvement in ptarmigan habitat conditions would likely occur over a much longer time frame than under Alternative 1 because impacts associated with sheep grazing would continue. However, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Landscape continued in the future, ptarmigan habitat conditions could be expected to gradually improve over time under Alternative 2.

Under Alternative 2, habitat conditions for ptarmigan would continue to be impacted in localized areas causing continued degraded habitat conditions in these localized areas. Under Alternative 2, about one third of ptarmigan habitat in the Landscape would continue to be affected by domestic sheep grazing. A continued gradual improvement in ptarmigan forage and cover conditions within summer and fall foraging areas would be expected under Alternative 2 even if numbers of domestic sheep remained relatively stable over the next few (5+) years. This is because at current sheep stocking levels, the observed gradual improvement in alpine plant communities across most allotments is expected to continue over the short term.

Alternative 3 (Adaptive Management with Forage Reserves):

Selecting Alternative 3 would be generally beneficial for ptarmigan, although less so than selecting Alternative 1, but more than selecting Alternative 2. Benefits to ptarmigan from selecting

Alternative 3 would likely be limited to the localized areas where current sheep grazing practices are degrading summer and fall ptarmigan foraging areas. Compared to Alternative 2, selecting Alternative 3 would have beneficial effects for ptarmigan because application of adaptive management strategies and design criteria are expected to result in more rapid improvements in habitat conditions in the areas where sheep grazing is degrading ptarmigan habitat conditions.

Benefits to ptarmigan from selecting Alternative 3 would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than under Alternative 2 due to application of adaptive management strategies and design criteria. In addition, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Landscape continued in the future, ptarmigan habitat conditions could be expected to gradually improve over time under Alternative 3.

Under Alternative 3, about 18% (8,855 acres) of ptarmigan habitat would be in areas suitable for domestic sheep grazing. The total of 18% of ptarmigan habitat in areas suitable for livestock grazing under Alternative 3 compares to 33% of ptarmigan habitat under Alternative 2. Therefore, selecting Alternative 3 would result in a 12% reduction in the amount of ptarmigan habitat, particularly summer and fall foraging areas, where there would be potential for livestock grazing impacts, compared to Alternative 2.

Selecting Alternative 3 would be more beneficial to ptarmigan habitat than selecting Alternative 2 because four vacant sheep allotments (Cave Basin, Fall Creek, Flint Creek and Pine River) that could be restocked under Alternative 2 would be closed to sheep grazing under Alternative 3. Also, portions of two other allotments (Johnson Creek and Rock Creek) that could be restocked under Alternative 2 would be closed to sheep grazing under Alternative 3. In addition, under Alternative 3, the three sheep forage reserve allotments (Leviathan and portions of Johnson Creek and Rock Creek) could be restocked only up to three years out of any ten consecutive years, compared to the potential for annual stocking under Alternative 2. For this reason, if the allotments were stocked as forage reserves under Alternative 3 the potential impacts to ptarmigan habitat from sheep grazing would be less than under the potential for grazing impacts that could occur if the allotments were stocked every year under Alternative 2.

It should be noted however, the three sheep forage reserve allotments proposed under Alternative 3 have not been grazed by sheep since 1970. For this reason, stocking sheep in these three allotments under either Alternative 2 or Alternative 3 would be a change from the current 40+ year history of no sheep grazing and potentially a change from the gradual improvement in ptarmigan habitat conditions due to having no domestic sheep present within the allotments for an extended period of time.

Selecting Alternative 3 would be less beneficial than selecting Alternative 1 because the localized areas currently degraded by sheep grazing would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins. Although more rapid improvement in habitat conditions for ptarmigan is expected under Alternative 3 than under Alternative 2, improvements in habitat conditions due to adopting the adaptive management approach are likely to be too small to affect ptarmigan populations or the total amount of habitat available in the Weminuche Landscape.

Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):

Selecting Alternative 4 would be generally beneficial for ptarmigan, more so than selecting Alternative 3, and much more so than selecting Alternative 2. However, selecting Alternative 4 would be less beneficial than selecting Alternative 1.

Benefits to ptarmigan for selecting Alternative 4 would be greater than for selecting Alternative 3 because the three sheep forage reserve allotments proposed under Alternative 3 would be closed to sheep grazing under Alternative 4. For this reason, the potential for impacts to ptarmigan habitat would be less under Alternative 4 than under Alternative 3. However, it should be noted that the three sheep forage reserve allotments proposed under Alternative 3 have not been grazed by sheep since 1970. For this reason the current 40+ year history of no sheep grazing and likely improvement in ptarmigan habitat conditions in these three allotments would remain unchanged under Alternative 4. Under Alternative 3, the three sheep forage reserve allotments could be restocked up to three years out of any ten consecutive years and thus impacts to ptarmigan habitat from the presence of domestic sheep that have not occurred in these allotments during the past 40+ years could occur under Alternative 3.

Under Alternative 4, about 15% (7,471 acres) of ptarmigan habitat would be in areas suitable for domestic sheep grazing. There would be no forage reserves authorized under Alternative. The total of 15% of ptarmigan habitat in areas suitable for sheep grazing under Alternative 4 compares to 18% of ptarmigan habitat under Alternative 3 and 33% of ptarmigan habitat under Alternative 2. Therefore, selecting Alternative 4 would result in a 3% reduction in the amount of ptarmigan habitat where there would be potential for sheep grazing impacts, compared to Alternative 3, and a 18% reduction compared to Alternative 2.

Benefits to ptarmigan from selecting Alternative 4 are likely to be limited to the localized areas in the currently active allotments where sheep grazing practices have degraded summer and fall ptarmigan foraging areas. Selecting Alternative 4 would have some beneficial effects for ptarmigan that use these areas because application of adaptive management strategies and design criteria should result in more rapid improvements in habitat conditions in the areas where sheep grazing is currently affecting those conditions.

Benefits to ptarmigan from selecting Alternative 4 would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than under Alternative 2 due to application of adaptive management strategies and project design criteria. Within the active allotments, there would likely be little difference in ptarmigan habitat improvement between Alternative 4 and Alternative 3 because adaptive management strategies and design criteria would be applied in active allotments under both Alternatives. However, Alternative 4 would provide greater benefits to ptarmigan habitat because the three forage reserve allotments authorized under Alternative 3 would be closed to sheep grazing under Alternative 4. Finally, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Weminuche Landscape continued in the future, ptarmigan habitat conditions would be expected to gradually improve over time under Alternative 4.

Selecting Alternative 4 would be less beneficial than selecting Alternative 1 because the localized areas currently degraded by sheep grazing activities in active allotments would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins. Although more rapid improvement in habitat conditions for ptarmigan is expected under Alternative 4 than under Alternatives 3 and 2, improvements in habitat conditions due to adopting the adaptive management approach are likely to be too small to affect ptarmigan populations or the total amount of habitat available in the Weminuche Landscape.

Cumulative Effects

See cumulative effects discussion below.

Determination

For the reasons stated in this analysis it is my determination that selecting Alternatives 2, 3 or 4 **“may adversely impact individual white-tailed ptarmigan but is not likely to result in a loss of viability in the planning area nor cause a trend toward federal listing, or loss of species viability rangewide.”**

North American Wolverine

The contiguous United States population of the North American wolverine was petitioned for listing under the Endangered Species Act in 1994 (USDI Fish and Wildlife Service 1995), then again in 2000 (USDI Fish and Wildlife Service 2003). Both times the U.S. Fish and Wildlife Service determined that the petitions “did not provide substantial scientific or commercial information indicating that listing the wolverine in the contiguous United States may be warranted”. In 2013 the USFWS proposed listing the wolverine as threatened under the Endangered Species Act (USDI Fish and Wildlife Service 2013). However, in August of 2014, the USFWS decided to “withdraw the proposed rule to list the distinct population segment of the North American wolverine occurring in the contiguous United States as a threatened species under the Endangered Species Act” (USDI Fish and Wildlife Service 2014). The listing withdrawal was based on “the conclusion that the factors affecting the DPS as identified in the proposed rule are not as significant as believed at the time of the proposed rule’s publication (February 4, 2013)”. After the listing withdrawal, wolverine was added back onto the list of species designated as sensitive in the U.S. Forest Service’s Rocky Mountain Region (USDA Forest Service 2015).

The wolverine is the largest member of the weasel family with adult males weighing 26 to 40 lbs (USDI Fish and Wildlife Service 2013). It resembles a small bear with a bushy tail. Wolverines are opportunistic feeders, consuming a variety of live foods but primarily scavenging carrion (Banci 1994). They have an excellent sense of smell enabling them to find food buried beneath deep snow.

Wolverine distribution in North America appears to be highly associated with the existence of persistent spring snow cover during the end of the denning period, mid-April through mid-May (Aubry et al. 2007, Copeland et al. 2010). Females dig natal dens primarily in snow-covered boulder talus in subalpine cirque basins. Use of natal dens begins in early February through late March, with use continuing through April and into May (Banci 1994, Copeland 1996, Magoun and Copeland 1998, Aubry et al. 2007, Copeland et al. 2010). Denning habitat in areas of deep persistent spring snow pack may be a limiting and critical component of wolverine habitat, especially when viewed in conjunction with the potential for displacement and disturbance of denning females by human winter recreational activities (Copeland 1996, Aubry et al. 2007, Copeland et al. 2010). Den abandonment has been reported as a common response to disturbance in the U.S. and Finland. Denning occurs prior to when domestic sheep are turned into allotments in the Weminuche Landscape.

Wolverines are generally associated with remote areas with little human activity, and remote areas appear necessary for viable populations. Research indicates wolverines are sensitive to disturbance when they are denning and have a naturally low reproductive rate (USDI Fish and Wildlife Service 2013, USDI Fish and Wildlife Service 2003). However, research has failed to document differences in wolverine density, habitat use or behavior patterns between wilderness areas and non-wilderness areas. It is generally accepted that wolverines require large areas of unfragmented range and habitat.

Wolverines occur at very low densities even under optimal conditions, but have very large home ranges and can travel long distances over rough terrain and deep snow (USDI Fish and Wildlife Service 2013, Inman et al. 2009, Banci 1994). Adult male home range size averaged 588 square miles in one Idaho study (Copeland 1996, USDI Fish and Wildlife Service 2013). In North America, wolverines occur primarily in boreal forests, tundra, and western mountain alpine areas from Alaska through Canada, and south into the contiguous United States (Aubry et al. 2007, Copeland et al. 2010, USDI Fish and Wildlife Service 2013). The current occupied range in the contiguous United States is not well known but thought to include Idaho, Montana, Oregon, Washington, Wyoming, and possibly California. Historic range also included Colorado, Maine, Michigan, Minnesota, New Hampshire, New York, North Dakota, Utah, and Wisconsin (Aubry et al. 2007,

Copeland et al. 2010, USDI Fish and Wildlife Service 2013). Colorado Parks and Wildlife lists the current status of wolverine in the state as Endangered (Colorado Parks and Wildlife 2015).

The Weminuche Landscape has not been documented to be currently occupied by wolverine. Prior to 2009, the last known wolverine in the state was documented in 1919 (Fitzgerald et al. 1994). Recent surveys by Colorado Parks and Wildlife have failed to detect the presence of wolverine in or near the Landscape. There are however, nearly annual reports, all unconfirmed, of wolverine sightings from the central San Juan Mountains, mostly between Silverton, Ouray and Lake City (S. Wait pers. comm.).

In June of 2009 the Greater Yellowstone Wolverine Program confirmed they had tracked a male wolverine fitted with a GPS satellite collar to north-central Colorado (Colorado Parks and Wildlife 2015, Inman et al. 2009). This individual, dubbed “M56”, was captured near Grand Teton National Park, Wyoming in April during an ongoing wolverine study and had travelled about 500 miles by June to reach Colorado. M56 remained in Colorado for over a year. The presence of M56 in Colorado for an extended period of time confirmed researcher’s predictions about potential habitat in Colorado and suggests that lack of prey is not a problem for the species (Colorado Parks and Wildlife 2015, Inman et al. 2009).

An aerial habitat inventory by Colorado Parks and Wildlife and wolverine researcher Jeff Copeland determined that the central San Juan Mountains appeared to provide some of the highest quality potential wolverine habitat in the state (S. Wait pers. comm.). A 1998 planned reintroduction of wolverine by CPW selected the San Juan and Rio Grande National Forests as the preferred reintroduction site because of its extensive area of alpine terrain (about 971 square miles), abundant potential denning sites in wilderness areas with deep snows remaining into late spring, abundant big game populations and presumed carrion availability, and moderate human impact. This area includes the entire Weminuche Landscape.

Direct and Indirect Effects

If individual wolverines were present in the Weminuche Landscape, sheep grazing is likely to occur in the same areas that provide core wolverine denning and foraging habitat. These areas are alpine basins and cirques and their associated subalpine forests. Grazing domestic sheep is most likely to have indirect effects on wolverine habitat, rather than direct effects on individual animals. Indirect effects would be mostly through potential reductions in habitat capability for wolverine summer prey species, disturbance to reproductive females from herders who are near young rearing sites, and disturbance to individual animals from livestock protection dogs. Sheep arrive on alpine grazing areas generally after females abandon their natal dens (Copeland 1996).

There is about 127,506 acres of potential wolverine habitat (alpine, and spruce-fir and cool-moist mixed conifer forests) on NFS lands in the Weminuche Landscape. About 43,546 acres (34%) is suitable for grazing sheep under current management (Alternative 2). About 22,255 acres (17%) of potential wolverine habitat would be suitable for sheep grazing under Alternative 3, and about 19,063 acres (15%) would be suitable for sheep grazing under Alternative 4. Viewing these figures in a different way suggests that about two thirds (66%) of potential wolverine habitat in the Landscape is not considered suitable for domestic sheep grazing under Alternative 2. About 83% of wolverine habitat in the Landscape would in areas not considered suitable for domestic sheep grazing under Alternative 3, and 85% under Alternative 4. For this reason, most of the potential wolverine habitat in the Landscape would not be affected by direct or indirect effects of sheep grazing under any action alternative.

Spruce-fir forest comprises about half (55%; 70,600 acres) of potential wolverine habitat in the Landscape (127,506 acres). Sheep pass through mature spruce fir stands on their way to and from

alpine pastures. However, sheep prefer to spend little time in dense stands of spruce fir forest because of the generally poor forage conditions under closed-canopy stands. In general, cattle also spend little time in mature spruce-fir stands because of the lack of forage under closed canopy stands. Usually, sheep and cattle impacts in closed canopy conifer forests are small in scale and limited in scope as livestock rest near the edges of parks or travel along well-worn trails between adjacent parks or to nearby water sources.

Spruce-fir forests are also in close proximity to some preferred sheep grazing areas and therefore some small and localized areas of grazing impacts were observed. However, wolverine is unlikely to be substantially affected by sheep grazing or cattle grazing activities because they primarily forage under closed-canopy mature spruce stands, which are unlikely to be substantially affected by sheep or cattle grazing activities.

Examination of the body of available monitoring data shows, for the project area overall, vegetative conditions are generally meeting the project's desired conditions (see sections 3.2 Soil and Water, and 3.3 Vegetation of the EIS). There are areas of concern however, specifically at bed grounds and trailing "choke points." These areas of concern are generally limited in scale and localized in their extent. Many of these areas of concern are due to management practices from decades past when sheep stocking rates and intensity of use were much higher than under current management practices. For these reasons, it is unlikely that sheep or cattle grazing under current management practices is reducing habitat capability for potential wolverine prey species, especially given the wide ranging nature of this elusive forest carnivore.

Alpine habitats comprise about one third (39%; 49,343 acres) of potential wolverine habitat in the Landscape (127,506 acres) and are the core habitats for wolverine denning and kit rearing, especially those areas with deep late spring snow packs (USDI Fish and Wildlife Service 2014, Copeland 1996). Under current management (Alternative 2), about 33% (16,057 acres) of alpine habitats would be in areas suitable for domestic sheep grazing. About 8,855 acres (18%) of alpine habitats would be suitable for sheep grazing under Alternative 3, and about 7,471 acres (15%) would be suitable for sheep grazing under Alternative 4.

Alternative 1 –No Action

Selecting Alternative 1 would be entirely beneficial to wolverine. Under Alternative 1, all wolverine habitats in the Landscape would be protected from impacts associated with domestic livestock grazing. Alternative 1 would provide gradual improvement in the condition of alpine habitats, but these improvements would likely be limited in scope because the extent of observed livestock impacts was limited, localized and not widespread. Improvement in alpine habitats would be limited to those areas where domestic sheep grazing was the primary browsing agent. Improvement in alpine habitat conditions under Alternative 1 would likely occur slowly over time because of the relatively short growing seasons in the alpine zone. The relatively small number of domestic sheep currently permitted to graze in the Weminuche Landscape (about 4,400), compared to decades past (about 11,500 in the 1940's), also suggests that the rate of improvement in alpine habitat conditions is likely to be less today than in decades past when domestic sheep numbers declined much more rapidly.

Alternative 2 (Current Management):

Selecting Alternative 2 would be neutral for wolverine due to the relatively low numbers of domestic sheep, compared to past decades, would likely continue on the Landscape for the foreseeable future. Selecting Alternative 2 would be much less beneficial than selecting Alternative 1 because improvements in alpine habitat conditions would likely occur over a much longer time frame than under Alternative 1. This is because impacts associated with sheep grazing would

continue under Alternative 2. However, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Landscape continued in the future, wolverine habitat conditions could be expected to gradually improve over time under Alternative 2.

Under Alternative 2, conditions of alpine habitats would continue to be impacted by livestock grazing in localized areas causing continued degraded habitat conditions in these localized areas. Under Alternative 2, about one third (33%) of alpine habitats in the Landscape would continue to be affected by domestic sheep grazing. A continued gradual improvement in alpine habitat conditions would be expected under Alternative 2 even if numbers of domestic sheep remained relatively stable over the next few (5+) years. This is because at current sheep stocking levels, the observed gradual improvement in alpine plant communities across most allotments is expected to continue over the short term.

Alternative 3 (Adaptive Management with Forage Reserves):

Selecting Alternative 3 would be generally beneficial for wolverine, although less so than selecting Alternative 1, but more so than selecting Alternative 2. Benefits to wolverine from selecting Alternative 3 would likely be limited to the localized areas where current sheep grazing practices are degrading alpine habitats. Compared to Alternative 2, selecting Alternative 3 would have beneficial effects for wolverine because application of adaptive management strategies and design criteria are expected to result in more rapid improvements in alpine habitat conditions in the areas where sheep grazing is affecting those conditions.

Benefits to wolverine from selecting Alternative 3 would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than under Alternative 2. This is due to the application of adaptive management strategies and design criteria under Alternative 3 that would not occur under Alternative 2.

Under Alternative 3, about 18% (8,855 acres) of alpine habitats would be in areas suitable for domestic sheep grazing. The total of 18% of alpine habitats in areas suitable for livestock grazing under Alternative 3 compares to 33% of alpine habitats under Alternative 2. Therefore, selecting Alternative 3 would result in a 12% reduction in the amount of alpine habitats where there would be potential for livestock grazing impacts, compared to Alternative 2.

Selecting Alternative 3 would be more beneficial to wolverine than selecting Alternative 2 because four vacant sheep allotments (Cave Basin, Fall Creek, Flint Creek and Pine River) that could be restocked under Alternative 2 would be closed to sheep grazing under Alternative 3. Also, portions of two other allotments (Johnson Creek and Rock Creek) that could be restocked under Alternative 2 would be closed to sheep grazing under Alternative 3. In addition, under Alternative 3, the three sheep forage reserve allotments (Leviathan and portions of Johnson Creek and Rock Creek) could be restocked only up to three years out of any ten consecutive years, compared to the potential for annual stocking under Alternative 2. For this reason, if the allotments were stocked as forage reserves under Alternative 3 the potential impacts to alpine habitats from sheep grazing would be less than under the potential for grazing impacts that could occur if the allotments were stocked every year under Alternative 2.

It should be noted however, the three sheep forage reserve allotments proposed under Alternative 3 have not been grazed by sheep since 1970. For this reason, stocking sheep in these three allotments under either Alternative 2 or Alternative 3 would be a change from the current 40+ year history of no sheep grazing, and potentially a change from the gradual improvement in alpine habitat conditions due to having no domestic sheep present within the allotments for an extended period of time.

Selecting Alternative 3 would be less beneficial than selecting Alternative 1 because the localized areas currently degraded by sheep grazing would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins. Although more rapid improvement in alpine habitat conditions is expected under Alternative 3 than under Alternative 2, improvements in habitat conditions due to adopting the adaptive management approach are likely to be too small to affect the total amount of habitat available in the Weminuche Landscape.

Selecting Alternative 3 would reduce the potential for sheep grazing activities to disturb individual wolverines, especially denning females, compared to Alternative 2. Disturbance could be from human herders or from the livestock protection dogs usually associated with each band of sheep. About 67% of alpine habitats, including wolverine denning habitat, are considered unsuitable for sheep grazing under current management (Alternative 2). Under Alternative 3, about 82% would be considered unsuitable for sheep grazing. The potential for disturbance would be somewhat reduced (by about 15%) by selecting Alternative 3 versus Alternative 2. For these reasons, the risk of encounters between herders, their livestock protection dogs, and individual animals of this wide ranging and naturally elusive species appears to be low.

Although there appears to be a small difference (15% reduction) between Alternative 2 and Alternative 3 in the amount of alpine area affected by sheep grazing, the Weminuche Landscape is in the center of a region identified by the CPW and wolverine researchers as providing some of the best and most extensive potential wolverine habitat in the state of Colorado. For this reason, even small changes in risk factors may provide substantial benefits to a species that is believed to be sensitive to human disturbance. However, it must be remembered that wolverines have not been confirmed to occur in the Landscape or elsewhere in southwest Colorado since 1919.

Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):

Selecting Alternative 4 would be generally beneficial for wolverine, more so than selecting Alternative 3, and much more so than selecting Alternative 2. However, selecting Alternative 4 would be less beneficial than selecting Alternative 1.

Benefits to wolverine for selecting Alternative 4 would be greater than for selecting Alternative 3 because the three sheep forage reserve allotments proposed under Alternative 3 would be closed to sheep grazing under Alternative 4. For this reason, the potential for impacts to alpine habitats would be less under Alternative 4 than under Alternative 3. However, it should be noted that the three sheep forage reserve allotments proposed under Alternative 3 have not been grazed by sheep since 1970. For this reason the current 40+ year history of no sheep grazing and likely improvement in alpine habitat conditions in these three allotments would remain unchanged under Alternative 4.

Under Alternative 4, only about 15% (7,471 acres) of alpine habitats would be in areas suitable for domestic sheep grazing. There would be no forage reserves authorized under Alternative. The total of 15% of alpine habitats in areas suitable for sheep grazing under Alternative 4 compares to 18% under Alternative 3, and 33% under Alternative 2. Therefore, selecting Alternative 4 would result in a 3% reduction in the amount of alpine habitats where there would be potential for sheep grazing impacts, compared to Alternative 3, and an 18% reduction compared to Alternative 2.

Benefits to wolverine from selecting Alternative 4 are likely to be limited to the localized areas in the currently active allotments where sheep grazing practices have degraded alpine habitats. Selecting Alternative 4 would have some beneficial effects because application of adaptive management strategies and design criteria should result in more rapid improvements in alpine habitat conditions in the areas where sheep grazing is currently affecting those conditions.

Benefits to alpine habitats from selecting Alternative 4 would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than under Alternative 2 due to application of adaptive management strategies and project design criteria. Within the active allotments, there would likely be little difference in alpine habitat conditions between Alternative 4 and Alternative 3 because adaptive management strategies and design criteria would be applied in active allotments under both Alternatives. However, Alternative 4 would provide greater benefits to alpine habitat conditions because the three forage reserve allotments authorized under Alternative 3 would be closed to sheep grazing under Alternative 4. Finally, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Weminuche Landscape continued in the future, alpine habitat conditions would be expected to gradually improve over time under Alternative 4.

Selecting Alternative 4 would be less beneficial than selecting Alternative 1 because the localized areas currently affected by sheep grazing activities in active allotments would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins. Although more rapid improvement in alpine habitat conditions is expected under Alternative 4 than under Alternatives 3 and 2, improvements in habitat conditions due to adopting the adaptive management approach are likely to be too small to affect the total amount of habitat available in the Weminuche Landscape.

The Weminuche Landscape is located adjacent to a region that is documented as providing an important connectivity area for forest carnivores (e.g. lynx) moving east/west through the central San Juan Mountains (Schultz et al. 2006). Given the Landscape's location in relation to high use connectivity habitat areas, its recognized high potential for sustaining wolverines and the remote nature of most of the landscape especially during the most sensitive time period of wolverine ecology (denning and early kit rearing), the Landscape is likely to be important to wolverine movement and regional connectivity, if any animals were present.

Selecting any of the action alternatives (Alternatives 2, 3 or 4) could impact individual wolverines, if they were to occur in the San Juan N.F., in the manners described above. Selecting any of the action alternatives would not cause a loss of viability on the planning area (the entire SJNF) because they are not known to exist on the SJNF. Because wolverine is believed to have been extirpated from the southern Rocky Mountains, including the state of Colorado (Aubry et al. 2007, Copeland et al. 2010, USDI Fish and Wildlife Service 2014), selecting any of the action alternatives would not cause a trend toward federal listing or loss of species viability rangewide.

Cumulative Effects

See cumulative effects discussion below.

Determination

For the reasons stated in this analysis it is my determination that Alternatives 2, 3 or 4 “**may adversely impact individual North American wolverines but is not likely to result in a loss of viability in the planning area nor cause a trend toward federal listing, or loss of species viability rangewide.**”

Rocky Mountain bighorn sheep

Rocky Mountain bighorn sheep were historically distributed across the mountainous portions of Colorado and much of the SJNF (Beecham et al. 2007). Desert bighorn sheep are not known or thought likely to occur in the Weminuche Landscape. Rocky Mountain bighorn sheep are designated by the Forest Service Rocky Mountain Region as a Sensitive Species on NFS lands within the Region (USDA Forest Service 2015). This designation implies there is concern for the long-term viability and/or conservation status of bighorn sheep on NFS lands in the Region (Beecham et al. 2007). This designation is based primarily on potential threats to the long-term viability of bighorn sheep populations, including diseases transmitted from domestic sheep, lack of connectivity and/or loss of genetic variability (fitness) due to habitat fragmentation, habitat loss, increased human disturbance on summer and winter grounds, competition for forage with domestic livestock, and predation on small isolated herds (USDA Forest Service 2013a, Beecham et al. 2007).

Although habitat degradation from fire suppression, highways, livestock grazing, and human disturbance is of concern, the susceptibility of bighorn sheep herds to population declines or extirpation due to respiratory diseases, which can be transmitted by domestic sheep or goats (Besser et al. 2012b, Cassirer et al. 2013), appears to be the greatest concern for bighorn sheep population persistence on the SJNF (USDA Forest Service 2013a).

Mortality of all age classes and depressed lamb recruitment resulting from pathogens introduced by domestic livestock are regarded as the primary limiting factor for bighorn sheep in Colorado (George et al. 2009). Physical contact between domestic sheep or goats and bighorn sheep increases the risk of disease transmission from domestic animals to bighorn sheep (Sells et al. 2015, Lawrence et al. 2010, Wehausen et al. 2011), with potential for a subsequent bighorn sheep mortality event and/or extended period of reduced recruitment (Besser et al. 2012b).

The primary disease agents are respiratory diseases to which domestic sheep and goats are typically resistant or unaffected, and to which bighorn sheep have little resistance (Carpenter et al. 2014, Cassirer et al. 2013, Besser et al. 2012a, Besser et al. 2012b, CAST 2008, George et al. 2008, Western Association of Fish and Wildlife Agencies 2012). Pneumonia caused by bacterial respiratory pathogens is considered the most virulent disease impacting bighorn sheep today (Besser et al. 2012b, George et al. 2009, Beecham et al. 2007). Pneumonia can result in all age die-offs followed by suppressed lamb recruitment for up to several decades after the initial die-off (The Wildlife Society 2015, George et al. 2008). Survivors become carriers of the disease and serve as a source of infection for other animals in the same herd, newborns, and other populations through natural movements, forays, or translocations (Sells et al. 2015, Cassirer et al. 2013, Besser et al. 2012b).

The complete range of mechanisms and/or causal agents that lead to disease events and low recruitment in bighorn sheep is still debated, and not all bighorn sheep disease events can be attributed to contact with domestic sheep or goats (Sells et al. 2015, Drew et al. 2014, Shannon et al. 2014, Colorado Parks and Wildlife 2013a, Besser et al. 2012b, Wehausen et al. 2011, George et al. 2009, Aune et al. 1998, Onderka and Wishart 1984). However, when contact between bighorn sheep and domestic sheep or goats has been documented the severity of the bighorn sheep die-off is typically more pronounced (Aune et al. 1998, Martin et al. 1996). In some cases, bighorn sheep disease events can be devastating population-limiting events with outbreaks affecting animals of all age classes, and resulting in prolonged periods of low lamb survival (Sells et al. 2015, Cassirer et al. 2013, Besser et al. 2012b, and 2012d).

The preponderance of scientific literature supports the potential for respiratory diseases to be transmitted from domestic sheep and goats to bighorn sheep (Carpenter et al. 2014, Lawrence et al. 2010), frequently followed by bighorn mortality events (Sells et al. 2015, Cassirer et al. 2013, Drew et al. 2014, Besser et al. 2012a, b, c, and 2012d, Western Association of Fish and Wildlife

Agencies 2012, USDA Forest Service 2011a, Wehausen et al. 2011, USDA Forest Service 2010a, CAST 2008, Schommer and Woolever 2001, Martin et al. 1996). It is recognized that opposing arguments question this science and dispute the connection. The preponderance of scientific literature, however, supports the potential for disease transmission between bighorn and domestic sheep and documents bighorn die-offs after contact with domestic sheep in captive and free range situations (Shannon et al. 2014, Besser et al. 2014, Cassirer et al. 2013, Drew et al. 2014, Besser et al. 2012b, Lawrence et al. 2010).

Research continues on the science of disease transmission, bighorn mortality events, and the potential for development of effective vaccines (The Wildlife Society 2015, Besser 2013, Miller 2011, Srikumaran 2011, Subramaniam et al. 2011, Wehausen et al. 2011). But until the science is better understood and/or effective vaccines are developed many organizations and researchers recommend it is prudent to consider and implement management actions designed to keep the species separate as a means to prevent the potential for disease transmission and subsequent bighorn mortality events (The Wildlife Society 2015, Colorado Parks and Wildlife 2013a, Western Association of Fish and Wildlife Agencies 2012, American Sheep Industry Association 2011, Cahn et al. 2011, USDA Forest Service 2011a, George et al. 2009, USAHA Joint Working Group 2009, CAST 2008, Beecham et al. 2007, Schommer and Woolever 2001).

Within the Weminuche Landscape, small portions of two active domestic sheep and goat allotments (Canyon Creek and Tank Creek), and portions of four vacant sheep allotments (Cave Basin, Flint Creek, Pine River and Rock Creek) overlap with Core Herd Home Range (CHHR) for bighorn sheep. In some portions of these six allotments, direct overlap exists between mapped Core Herd Home Range for bighorn sheep and areas suitable for grazing by domestic sheep. Additional source (suitable) habitat for bighorn sheep extends across other areas of these allotments, suggesting that bighorn sheep could travel or disperse (i.e. foray) across currently vacant but suitable source habitats, creating a potential risk of physical contact between bighorn and domestic sheep. The risk of physical contact between foraging bighorn sheep and domestic sheep corresponds to the number of bighorn sheep in a herd, the proximity of domestic sheep allotments and bighorn CHHR's, the distribution of suitable sheep grazing areas within an active allotment, the distribution of bighorn sheep source habitats (suitable habitat) across the landscape, and the distance and frequency of bighorn sheep forays outside their Core Herd Home Range.

The bighorn sheep Core Herd Home Ranges (CHHRs) referred to throughout this document are the 2013 summer range maps provided by Colorado Parks and Wildlife (CPW). CPW maps the summer range of bighorn sheep herds as that part of their overall range where 90% of individual bighorn sheep are located between spring green-up and the first heavy snowfall. Summer range does not necessarily include all bighorn occurrences during the summer season because small numbers (< 10%) of bighorn sheep may occur outside the mapped summer range. In addition, small numbers of bighorn sheep rams and ewes may leave their CHHR during summer and disperse (i.e. foray). For these reasons it is important to consider the proximity of bighorn CHHR, as well as the amount and juxtaposition of suitable bighorn summer source habitats in relation to active domestic sheep allotments and driveways when considering the potential for interaction between the species.

A "Risk Assessment" was conducted that focused on the relative potential for risk of physical contact between bighorn and domestic sheep in relation to the selection of one action alternative over another as the alternatives are described in the EIS (see EIS Chapter 2). No presumption was made that physical contact would lead to disease transmission or a subsequent bighorn sheep mortality event. However, the assumption was made based on the preponderance of scientific evidence, that physical contact between bighorn sheep and domestic sheep results in an increased risk of disease transmission to bighorn sheep, with increased potential for a subsequent bighorn

mortality event. As part of the analysis process, the Risk of Contact Tool, prepared by the USDA Forest Service Bighorn Sheep Working Group (USDA Forest Service 2013b), was used to help evaluate bighorn sheep movements (i.e. forays) outside their CHHR, and assess the potential for risk of contact between bighorn sheep and domestic sheep allotments in the Weminuche Landscape.

The “Risk Assessment” process followed a four-step approach to risk assessment and viability analysis outlined in a letter on August 2007 by the Deputy Chief of the Forest Service (USDA Forest Service 2011a, USDA Forest Service 2011b). This process directed field units to conduct qualitative, and where possible quantitative analyses of the potential for interaction between domestic and bighorn sheep when the agency is making decisions requiring National Environmental Policy Act (NEPA) analysis regarding livestock grazing activities. The guidance provided in the Forest Plan, and thus the goal of these analyses, is to prevent physical contact between domestic and bighorn sheep, thereby minimizing the potential for disease transmission and a subsequent mortality event of bighorn sheep.

The S-16, Cimarrona Peak, and S-28, Vallecito Creek bighorn herds are considered by CPW to represent one large interconnected meta-population, along with S-15, the Sheep Mountain herd, to the east. Together, these three herds (GMUs) comprise the Weminuche Population Data Analysis Unit (DAU RBS-20). The current estimate for the Weminuche Population is 425 bighorn sheep, which includes 200 sheep in S-15, 135 sheep in S-16, and 90 sheep in S-28 (Weinmeister 2012). The current population objective for the Weminuche Population is to allow the population to expand to a maximum of 4.4 bighorn sheep/square kilometers. The 2010 population estimate for the Weminuche DAU was 2.2 bighorn sheep/square kilometer (Weinmeister 2012), well below the population objective of 4.4 sheep/square kilometer.

There is no mapped overlap between domestic sheep allotments in the Weminuche Landscape and mapped summer range for S-15, although the Weminuche Population is considered to be an interconnected meta-population. Because the three herds (GMU’s) are considered to be an interconnected meta-population with regular biological interactions, it is likely that decisions regarding domestic sheep grazing in the Weminuche Landscape could have indirect effects to the S-15 Sheep Mountain Herd through its biological connections with S-16 and S-28. The level of risk to S-15 from indirect effects through exchange of individual bighorns across the larger meta-population is thought to be lower as compared to the direct effect of domestic sheep grazing in close proximity to S-16 and S-28 and potentially coming into contact with foraging members of the S-16 and S-28 herds. Domestic sheep grazing activities within proximity to S-15 are managed by the Pagosa Ranger District of the SJNF, and by the Divide Ranger District of the Rio Grande National Forest (RGNF).

The Weminuche Population (DAU RBS-20) is one of the largest indigenous bighorn sheep populations in the state (Weinmeister 2012). A DAU management plan was developed for the Weminuche Population, DAU RBS-20 (Weinmeister 2012). The Weminuche Population (DAU RBS-20) is a Tier 1 population. Primary (Tier 1) populations are regarded as those large, native populations comprised of one or more interconnected herds that have received few, if any supplemental releases of bighorn sheep in the past. These populations likely represent those indigenous bighorn populations that have maintained the greatest genetic diversity, and their ranges represent habitats where bighorns have been best able to persist in sizeable numbers despite various adversities (George et al. 2009). As such, CPW considers the Weminuche Population to be among the most important bighorn herds in the state, which places the population in the top priority State-wide for inventory and monitoring, habitat protection and improvement, disease prevention, and research.

A Tier 1 population has ≥ 100 animals for $\geq 90\%$ of the years since 1986, and native populations comprised of one or more interconnected herds that have received few (< 50 animals total), if any, supplemental releases of bighorn sheep in the past (George et al 2009). For all these reasons, George et al. (2009) recommend considering all opportunities to reduce the potential for physical contact with domestic sheep, thereby reducing potential for subsequent disease transmission and bighorn mortality events within Tier 1 populations.

There is some recent concern for the population status of the S-28 Vallecito Creek Herd. This concern is due to the recent (since 2012) decline in the estimated total population size of S-28. This concern is also due to eight mature rams having been found dead in S28 between 2010 and 2014 and the cause of death remains unknown (Weinmeister pers. comm.), adding concern for the status of the S28 herd. Recent CPW monitoring data indicates lamb production has remained stable during this same time. Why a high number of mature rams have been found dead in S-28, yet lamb production appears to remain stable and normal is unknown. A contributing factor may be the remote nature of this DAU and the core herd areas within it making monitoring activities and animal detections from aircraft difficult. Additional monitoring activities and monitoring opportunities in S-28 are being discussed by CPW and the Forest Service in response to observations of recent ram mortality and the perception of a recent decline in overall bighorn observations in S-28.

The current S-71 West Needles Herd was established with animals translocated from the Georgetown Herd in 2000, and 2002-2003 (Beecham et al. 2007). Bighorn sheep now appear to use the entire Animas River Canyon from Rockwood northeast to Needle Creek, and perhaps somewhat further north particularly on the west side. The primary summer range of this herd is the West Needle Mountains, and primary winter and lambing range is the Animas River Canyon from Rockwood to the Cascade Wye (Beecham et al 2007), along with more recent evidence of lambing at higher elevations in the West Needle Mountains (Weinmeister pers. comm.). Recent observations (summer 2012 through 2015) show increased bighorn use along U.S. Highway 550 near Coal Bank Pass, west of the West Needle Mountains, indicating the herd may be expanding its range to the west and north.

The total population size of the S-71 West Needles Herd is estimated at about 60 animals. Because S-71 is a translocated herd it is considered by CPW to be an 'unclassified' herd (George et al. 2009). Populations that do not meet criteria for either a Tier 1 or Tier 2 population are characterized as "unclassified" populations (Weinmeister pers. comm.). As an unclassified herd, S-71 is placed at a lower priority for inventorying, habitat protection and improvement, and research, as compared to populations that are considered primary core populations or Tier 2 populations. Also, as a translocated population, CPW recognizes the presence of pre-existing active domestic sheep grazing allotments to the north, east, and west of S-71. CPW does not advocate closure of pre-existing active domestic sheep allotments based solely on the potential for interaction between domestic and bighorn sheep originating from translocated herds (Colorado Parks and Wildlife 2013a). All of the currently active domestic sheep allotments in the Weminuche Landscape were active long prior to the establishment of the S-71 herd by CPW translocations.

The "Risk Assessment" described above was conducted to analyze the potential impacts to native Rocky Mountain bighorn sheep of grazing domestic sheep under each of the project's three action alternatives (Schultz 2015). Findings of the "Risk Assessment" analysis are briefly summarized below. The full "Risk Assessment" is included in the project record.

The "Risk Assessment" analysis found that the Weminuche Landscape intersects the Core Herd Home Range (CHHR) of three bighorn sheep herds, with each herd representing a Game Management Unit (GMU). The three herds with CHHR intersecting the Weminuche Landscape include: S-16, the Cimarrona Peak Herd, S-28, the Vallecito Creek Herd, and S-71, the West

Needles Herd. There is about 2,457 acres of mapped overlap with the CHHR for the West Needles Herd S-71 in the Canyon Creek and Tank Creek Allotments. There is about 39,516 acres of mapped overlap with the CHHR for the Vallecito Creek Herd S-28 in the Cave Basin, Flint Creek, Pine River and Rock Creek Allotments. There is about 4,080 acres of mapped overlap with the CHHR for the Cimarrona Peak Herd S-16 in the Pine River Allotment.

The “Risk Assessment” analysis found that under current condition (Alternative 2) there is overlap between mapped bighorn CHHR’s and six domestic sheep grazing allotments in the Weminuche Landscape (Cave Basin – vacant, Canyon Creek – vacant, Flint Creek – vacant, Rock Creek – vacant, Pine River – vacant and Tank Creek - active). The following table (Table 7) and paragraphs briefly summarize the findings of the “Risk Assessment” analysis and the qualitative ratings for risk of physical contact for each of the 13 livestock allotments in the Weminuche Landscape under the three action alternatives.

Table 7. Summary of Qualitative ratings of the risk of physical contact between domestic and bighorn sheep by allotment under Alternative 2 (current management), Alternative 3 (forage reserves), and Alternative 4 (Preferred Alternative) in the Weminuche Landscape grazing analysis area.

Allotment (Current Status)	Alternative 2 (Current) Allotment Rank of Risk of Physical Contact (Assumes Vacant Allotments would be Stocked)	Alternative 3 (Forage Res’s) Allotment Rank of Risk of Physical Contact (Assumes Forage Reserve Allotments would be Stocked)	Alternative 4 (Preferred) Allotment Rank of Risk of Physical Contact (Assumes Vacant Allotment would be Stocked)
Burnt Timber (Active)	Moderate	Moderate	Moderate
Canyon Creek (Vacant)	High*: 17%, S-71	Moderate	Moderate
Cave Basin (Vacant)	High*: 87%, S-28	Proposed Closed	Proposed Closed
Endlich Mesa (Active)	High	High	High
Fall Creek (Vacant)	High	Proposed Closed	Proposed Closed
Flint Creek (Vacant)	High*: 55%, S-28	Proposed Closed	Proposed Closed
Johnson Creek (Vacant)	High	High	Proposed Closed
Leviathan (Vacant)	High	High	Proposed Closed
Pine River (Vacant)	High*: 37%, S-16 & S-28	Proposed Closed	Proposed Closed
Rock Creek (Vacant)	High*: 8%, S-28	High	Proposed Closed
Spring Gulch (Active)	Low	Low	Low
Tank Creek (Active)	High*: 13%, S-71	High	High
Virginia Gulch (Active)	High	High	High

*Bighorn CHHR Intersects Allotment:
% of Allotment, Bighorn CHHR

The **Burnt Timber Allotment** is located southeast of the CHHR of the West Needles Herd S-71, and west of the CHHR of the Vallecito Creek Herd S-28. There is no overlap between the Burnt Timber allotment and bighorn CHHR for any bighorn sheep herd under current allotment configuration (Alternative 2) or under a minor boundary adjustment made under Alternatives 3 and 4. It is primarily a trailing allotment, providing the Tank Creek and Virginia Gulch bands and the recently vacant Canyon Creek allotment with access to higher elevation primary grazing ranges.

Compared to other allotments in the Weminuche Landscape, the Burnt Timber Allotment has a relatively high percentage of the allotment suitable for domestic sheep grazing (77% of the Allotment). Although there is a relatively large amount of suitable domestic sheep grazing range in

the allotment, there is a relatively low amount of overlap of that suitable range with bighorn source habitat (about 20% of suitable domestic sheep range is bighorn source habitat). The nearest bighorn CHHR to the Burnt Timber Allotment is the West Needles Herd S-71. The distance to the West Needles Herd CHHR is 4.1 miles away at its closest point.

Based on the information presented in the Risk Assessment a rank of “**Moderate Risk**” was assigned to the Burnt Timber Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternatives 2, 3 and 4.

The **Canyon Creek Allotment** is located along the eastern edge of Weminuche Landscape and overlaps with the CHHR for the West Needles Herd S-71. A boundary adjustment proposed under Alternatives 3 and 4 would eliminate the entire zone of overlap from the allotment, and the remainder of the allotment could be converted to a cattle allotment. The allotment would remain a vacant domestic sheep allotment. The allotment was grazed by domestic sheep annually through the 2011 season, was vacant in the 2012 grazing season, and has been stocked with cattle at the request of the permittee beginning in the 2013 grazing season. Under current management (Alternative 2) it is considered a vacant domestic sheep allotment stocked temporarily with cattle but could be restocked administratively with sheep at a later date.

Under current condition (Alternative 2) there is about 1,005 acres of overlap with the S-71 CHHR, about 16 percent of the allotment. All of the overlap area is on the east side of the Animas River. Within this area of overlap, about 65 acres (6%) is suitable domestic sheep grazing range. Under Alternatives 3 and 4, the entire area of overlap with the S-71 CHHR would be removed from the allotment and closed to livestock grazing. Under Alternative 2 the Canyon Creek Allotment has about 3,467 acres of suitable domestic sheep grazing range, about half (55%) of the Allotment. There is a relatively small amount of bighorn source habitat in the allotment, 15% of the allotment, and most is located on the opposite side of the allotment from the S-71 CHHR. Although there is a substantial amount of suitable domestic sheep grazing range in the allotment (3,467 acres), there is only a very small overlap of that suitable range with bighorn source habitat (178 acres, about 5% of suitable domestic sheep range in the allotment).

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Canyon Creek Allotment under Alternative 2 for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternative 2, and a rank of “**Moderate Risk**” under Alternatives 3 and 4.

The **Cave Basin Allotment** is located in the middle of the Weminuche Landscape. The entire allotment is located within the Weminuche Wilderness. Most of the allotment overlaps with the CHHR for the Vallecito Creek Herd S-28. Under current condition (Alternative 2) there is about 19,575 acres of overlap with the S-28 CHHR, about 87 percent of the allotment. Within this overlap area, about 5,389 acres (28%) is suitable domestic sheep grazing range. Bighorn sheep are regularly observed in eastern and northern portions of the allotment during summer, and large portions of the eastern half of the allotment overlap with areas mapped by CPW as bighorn summer concentration area. Bighorns have been documented in the area since at least the 1940s.

The allotment was last grazed by domestic sheep in 1988 and has remained vacant since then. There was strong circumstantial evidence of physical contact between transplanted bighorns and domestic sheep grazed in the allotment in 1988, and strong evidence that this contact resulted in a presumed complete mortality event of the released bighorns before their first winter. Disease did not appear to have been transmitted from the transplanted bighorns to the native bighorn herd because population size and lamb survival remained stable in the native bighorn herd after the event (Weinmeister 2012).

Under current management (Alternative 2), Cave Basin is considered a vacant domestic sheep allotment that could be restocked administratively. Under Alternatives 3 and 4, the allotment is proposed to be closed to domestic sheep grazing. Also under Alternative 3, the southern approximately one third of the allotment (6,036 acres, 27% of the allotment) is proposed to be converted to a cattle forage reserve allotment, allowing cattle grazing for a maximum of three out of any ten consecutive years. The entire area of this proposed cattle forage reserve allotment overlaps with bighorn CHHR for the Vallecito Creek Herd S-28. Under Alternative 4, the allotment is proposed to be closed to all livestock grazing.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Cave Basin Allotment under Alternative 2 for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternative 2. Under Alternatives 3 and 4 the allotment is proposed to be closed.

The **Endlich Mesa Allotment** is located on the southwest side of the Weminuche Landscape. It is located between the Florida River and Vallecito Creek drainages. About three quarters of the allotment is located within the Weminuche Wilderness. There is no direct overlap with bighorn CHHR for any of the bighorn herds in the analysis area.

A reliable report of bighorn sheep seen within ¼ mile of domestic sheep occurred in late summer of the 2012 or 2013 grazing season. This report confirms the presence of foraging bighorns within the allotment and in close proximity to domestic sheep during the summer grazing season. Domestic sheep have been grazed in the allotment annually since at least 1928, and probably earlier.

About half of the allotment is either too steep or produces too little forage to be suitable for grazing. Most of the suitable grazing range is located at the higher elevations near or above timberline, but older spruce-fir timber harvest areas in the lower third of the allotment also provide substantial amounts of grazing range. Under current management (Alternative 2) the Endlich Mesa Allotment is an active domestic sheep allotment. Under Alternatives 3 and 4, the allotment would remain an active domestic sheep allotment.

Under all alternatives the Endlich Mesa Allotment has approximately 4,829 acres (43%) of suitable domestic sheep grazing range. There is a larger amount of bighorn source habitat in the allotment, 6,056 acres or 54% of the allotment. There is substantial overlap in the allotment between suitable domestic sheep range and bighorn summer source habitat, with 40% of suitable domestic sheep range also bighorn summer source habitat. The northern third of the allotment is dominated by large contiguous patches of bighorn source habitat. In the southern two-thirds of the allotment, bighorn source habitat is primarily in a narrow strip along the eastern boundary of the allotment and in a few isolated patches within the interior of the allotment. The closest distance from the Endlich Mesa Allotment to the Vallecito Creek Herd S-28 CHHR is 2.1 miles away.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Endlich Mesa Allotment for the potential for physical contact between bighorn and domestic sheep under Alternatives 2, 3 and 4 when domestic sheep are present on the allotment.

The **Fall Creek Allotment** is located on the southwest side of the Weminuche Landscape. It is located entirely on the west side of the Vallecito Creek drainage. The entire allotment is located within the Weminuche Wilderness. There is no direct overlap with bighorn CHHR for any of the bighorn herds in the analysis area, although it is immediately adjacent (within 0.1 mile) to the Vallecito Creek Herd S-28 CHHR, and sheep trailed to the allotment would likely have to pass through the S-28 CHHR to reach the allotment. Bighorn sheep have not been reported within the

allotment during the summer grazing season and no reports have been received of bighorn observations along the portion of the Vallecito Creek Trail leading to the allotment.

A 1960 grazing analysis showed that 3,397 acres of the allotment were in fair condition, and 2,650 acres were in poor condition. No portion of the allotment's vegetation was considered to be in good or excellent condition classes. The last year of domestic sheep grazing was 1968. Under current management (Alternative 2) the Fall Creek Allotment is considered a vacant domestic sheep allotment that could be restocked administratively. Under Alternatives 3 and 4, the allotment is proposed to be closed to all domestic livestock grazing.

Under Alternative 2 the Fall Creek Allotment has 11,386 acres within the allotment, of which approximately 1,092 acres (10%) are suitable domestic sheep grazing range. There is a much larger amount of bighorn source habitat in the allotment (7,001 acres or 61% of the allotment) than suitable domestic sheep grazing range (1,092 acres or 10% of the allotment). There is substantial overlap in the allotment between suitable domestic sheep range and bighorn summer source habitat, with 57% of suitable domestic sheep range (620 acres) also classified as bighorn summer source habitat. Much of the western and northern portions of the allotment are bighorn source habitat, especially near the heads of drainages and in the many avalanche chutes that bisect the allotment. There are some large contiguous patches of bighorn source habitat along the western boundary of the allotment. The closest distance from the Fall Creek Allotment to the Vallecito Creek Herd S-28 CHHR is 0.1 miles away.

Based on information presented in the Risk Assessment a rank of "**High Risk**" was assigned to the Fall Creek Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternative 2. Under Alternatives 3 and 4 the allotment is proposed to be closed.

The **Flint Creek Allotment** is located roughly in the middle of the Weminuche Landscape. The entire allotment is located within the Weminuche Wilderness. Much of the allotment (55%, 9,008 acres) overlaps with CHHR for the Vallecito Creek Herd S-28. About 22% of the allotment is suitable domestic sheep grazing range, much less than the 54% of the allotment mapped as bighorn summer source habitat. Bighorn sheep are regularly observed in western, northern and southeastern portions of the allotment during summer, and large portions of the western half of the allotment overlap with areas mapped by CPW as bighorn summer concentration area. Bighorns have been documented in the area since at least the 1940s. There is consensus that within the past 20 years bighorn use areas have likely expanded slightly in the southeast portion of the allotment.

Inspections cited in the 1969 management plan state that overgrazing in the northeast part of the allotment was a problem leading to erosion and closures including Flint Lake and recreation horse allotments along middle and lower Flint Creek. Domestic sheep grazing was first permitted in the allotment in 1928 and it was last grazed by domestic sheep in 1972. Under current management the Flint Creek Allotment is considered a vacant domestic sheep allotment that could be restocked administratively. Under Alternatives 3 and 4, the allotment is proposed to be closed to all domestic livestock grazing.

Under Alternative 2 the Flint Creek Allotment has 16,358 acres within the allotment, of which about 22% are suitable domestic sheep grazing range. There is a relatively large amount of bighorn source habitat in the allotment, about 54% of the allotment. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with 39% of suitable domestic sheep range also bighorn summer source habitat. Most of the northern two-thirds of the allotment is bighorn source habitat with large contiguous areas of interconnected habitat patches spanning long distances across alpine ridges and basins.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Flint Creek Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternative 2. Under Alternatives 3 and 4 the allotment is proposed to be closed.

The **Johnson Creek Allotment** is located in the north-central portion of the Weminuche Landscape. It is located entirely on the west side of the Vallecito Creek drainage. The entire allotment is located within the Weminuche Wilderness. There is no direct overlap with bighorn CHHR for any of the bighorn herds in the analysis area, but the allotment is immediately adjacent (within 0.1 mile) to the Vallecito Creek Herd S-28 CHHR. Under current management (Alternative 2) the Johnson Creek Allotment is considered a vacant domestic sheep allotment that could be restocked administratively.

Under Alternative 3, it is proposed that approximately the southeastern quarter of the allotment would be added to the Fall Creek Allotment and permanently closed to livestock grazing. The remaining three quarters of the allotment are proposed to be combined with the Leviathan Allotment and about two thirds of the Rock Creek Allotment to form a single domestic sheep forage reserve allotment. This would allow domestic sheep grazing for a maximum of three out of any ten consecutive years. Under Alternative 4 the allotment would be permanently closed to all livestock grazing.

Bighorn sheep have not been reported within the allotment during the summer grazing season and no reports of have been received of bighorn observations along the portion of the Vallecito Creek Trail that is within or near the allotment, or along the Johnson Creek Trail. Domestic sheep were almost certainly grazed in what is now the Johnson Creek Allotment beginning in the early 1900's. The last year of domestic sheep grazing was 1968.

Under current configuration (Alternative 2) the Johnson Creek Allotment has about 11% of the allotment suitable domestic sheep grazing range. There is a relatively large amount of bighorn source habitat in the allotment, 76% of the allotment. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with 51% of suitable domestic sheep range also bighorn summer source habitat. Much of the western, northern and southern portions of the allotment are bighorn source habitat, especially near the heads of drainages and in the many avalanche chutes that bisect the allotment. There are some large contiguous patches of bighorn source habitat along the western boundary of the allotment. The closest distance from the Johnson Creek Allotment to the Vallecito Creek Herd S-28 CHHR is 0.1 miles away. Due to adjustments made in the allotment boundary under Alternative 3, the distance was increased slightly to 0.4 miles under Alternative 3.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Johnson Creek Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternatives 2 and 3. Under Alternative 4 the allotment is proposed to be closed.

The **Leviathan Allotment** is located in the north-central portion of the Weminuche Landscape. It is located entirely on the west side of the Vallecito Creek drainage. The entire allotment is located within the Weminuche Wilderness. There is no direct overlap with bighorn CHHR for any of the bighorn herds in the analysis area but the allotment is in close proximity (0.9 miles) to the Vallecito Creek Herd S-28 CHHR. Under current management (Alternative 2) the Leviathan Allotment is considered a vacant domestic sheep allotment that could be restocked administratively.

Under Alternative 3, it is proposed to be combined with portions of the Johnson Creek Allotment and about two thirds of the Rock Creek Allotment to form a single domestic sheep forage reserve allotment. This would allow domestic sheep grazing for a maximum of three out of any ten consecutive years. Under Alternative 4 the allotment would be permanently closed to all livestock grazing. The boundary of the Leviathan Allotment would not change between any alternative.

Domestic sheep were almost certainly grazed in what is now the Leviathan Allotment beginning in the early 1900's. Transects done in 1960 indicated that the major part of the allotment was in poor condition due to heavy use. The allotment was last grazed in 1970.

Bighorn sheep have not been reported within the allotment during the summer grazing season and no reports of have been received of bighorn observations along the portion of the Vallecito Creek Trail that is within or near the allotment.

About 13% of the Leviathan Allotment is suitable domestic sheep grazing range. There is a much larger amount of bighorn source habitat, 81% of the allotment. Most of the western, northern and southern portions of the allotment are bighorn source habitat, especially near the heads of drainages and in the many avalanche chutes that bisect the allotment. Most of the allotment is dominated by large contiguous patches of bighorn source habitat. The closest distance from the Leviathan Allotment to the Vallecito Creek Herd S-28 CHHR is 0.9 miles away.

Based on information presented in the Risk Assessment a rank of "**High Risk**" was assigned to the Leviathan Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternatives 2 and 3. Under Alternative 4 the allotment is proposed to be closed.

The **Pine River Allotment** is located on east side of the Weminuche Landscape. It is located at the headwaters of the Pine River drainage. The entire allotment is located within the Weminuche Wilderness. This is the largest and one of the oldest domestic sheep allotments on the Columbine Ranger District. It directly overlaps with CHHR for the Vallecito Creek Herd S-28 and CHHR for the Cimarrona Peak Herd S-16, totaling about 37% of the allotment. Also within this overlap area are mapped bighorn summer concentration areas and production areas. Bighorn sheep are known to use all these portions of the allotment during spring, summer and fall, and for lambing. Bighorns have been documented in the area since at least the 1940s and continue to be documented in the area every summer.

Domestic sheep grazing in what is now the Pine River Allotment probably began in the late 1800's. In 1978 the La Osa, Snowslide-La Vaca, and Divide Paso allotments were combined to form the current Pine River allotment. This was done to enable a portion of the area to be rested every year, in order to accommodate increasing recreation demands. A 1978 memo states that if available forage were the only consideration, this allotment had the capacity to graze twice the number of sheep actually authorized. Heavy recreation use was the limiting factor. The allotment was last grazed in 1980. Under current management (Alternative 2) the Pine River Allotment is considered a vacant domestic sheep allotment that could be restocked administratively. Under Alternatives 3 and 4 the allotment is proposed to be permanently closed to domestic livestock grazing.

Under current configuration (Alternative 2) about 37% of the Pine River Allotment is suitable domestic sheep grazing range. There is a larger amount of bighorn source habitat, about 39% of the allotment. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with 30% of suitable domestic sheep range also bighorn summer source habitat. Much of the northern, central and southern portions of the allotment are bighorn source habitat, especially near the heads of drainages and along ridge crests such as the Continental Divide. There are large contiguous patches of bighorn source habitat throughout the allotment.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Pine River Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternative 2. Under Alternatives 3 and 4 the allotment is proposed to be closed.

The **Rock Creek Allotment** is located in the north-central portion of the Weminuche Landscape. It is located at the headwaters of the Vallecito Creek drainage. The entire allotment is located within the Weminuche Wilderness. About 8% of the allotment overlaps with the CHHR for the Vallecito Creek Herd S-28. Within this overlap area, about 7% is suitable domestic sheep grazing range and 98% is bighorn summer source habitat. Bighorn sheep are known to use these portions of the allotment during summer. This portion of the allotment is immediately adjacent (less than ¼ mile) to mapped bighorn summer concentration areas. Bighorns have been documented in the area since at least the 1940s.

Under current management (Alternative 2) the Rock Creek Allotment is considered a vacant domestic sheep allotment that could be restocked administratively. Under Alternative 3, it is proposed that approximately the southeastern third of the allotment would be permanently closed to livestock grazing. The remaining two thirds of the allotment are proposed to be combined with the Leviathan Allotment and about two thirds of the Johnson Creek Allotment to form a single domestic sheep forage reserve allotment. This would allow domestic sheep grazing for a maximum of three out of any ten consecutive years. Under Alternative 3, the closest distance from the Rock Creek Allotment to the Vallecito Creek Herd S-28 CHHR is 1.1 miles away. Under Alternative 4 the entire allotment would be permanently closed to all livestock grazing.

Domestic sheep grazing in what is now the Rock Creek Allotment began in the early 1900's. Several different allotment combinations were tried in the 1940's in response to overuse. The areas mentioned in inspection reports as overused were still in a poor condition class in 1960. Overall however, most of the allotment (66%) was being used under capacity, with only specific areas being overused. The allotment was last grazed in 1970.

Reduced use in the Rocky Benches and Hunchback portions of the allotment was suggested in 1969 to protect the area for bighorn sheep. Bighorn sheep have not been reported during the summer grazing season within that portion of the allotment proposed to remain open as a forage reserve allotment. No reports have been received of bighorn observations along the portion of the Vallecito Creek Trail that is within or near the allotment, including along the lower Rock Creek Trail.

Under current configuration (Alternative 2) about 29% of the Rock Creek Allotment is suitable domestic sheep grazing range. There is a relatively large amount of bighorn source habitat, 82% of the allotment. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with 64% of suitable domestic sheep range also bighorn summer source habitat. Much of the northern, central and southern portions of the allotment are bighorn source habitat, especially near the heads of drainages and along ridge crests such as the Continental Divide. There are large contiguous patches of bighorn source habitat throughout the allotment.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Rock Creek Allotment for the potential for physical contact between bighorn and domestic sheep when domestic sheep are present on the allotment under Alternatives 2 and 3. Under Alternative 4 the allotment is proposed to be closed.

The **Spring Gulch Allotment** is located well south of the Weminuche Landscape, south of Lemon Reservoir. None of the allotment is located within the Weminuche Wilderness. There is no overlap

between the Spring Gulch Allotment and bighorn CHHR for any bighorn sheep herd under any alternative. It is primarily a trailing allotment, providing a brief period of forage enroute to and returning from high country allotments. It has the largest area at relatively low elevation of all allotments in the Landscape. In 2002 the Missionary Ridge fire burned the majority of the allotment. Bighorn sheep have not been reported in or near the allotment during the summer grazing season. Under current management (Alternative 2) it is an active domestic sheep allotment. Under Alternatives 3 and 4, the allotment would remain an active domestic sheep allotment.

The allotment was managed by BLM until 1983 when it was transferred to the Forest Service. The allotment was stocked with cattle off and on through 1996, and in 2004 it was converted to a sheep trailing allotment, using the allotment in addition to leased private lands within the allotment. The allotment is used no more than 10 days in the spring and no more than 6 days in the fall. The short-duration of use was based in part on lack of water for long periods across most of the allotment. There is no fence separating NFS lands from private lands.

Compared to other allotments in the Weminuche Landscape, the Spring Gulch Allotment has a relatively high percentage of the allotment suitable for domestic sheep grazing (68% of the Allotment). There is very little bighorn source habitat in the allotment (4% of the allotment). The shortest distance to the nearest bighorn CHHR, Vallecito Creek Herd S-28, is 7.7 miles away.

Based on information presented in the Risk Assessment a rank of “**Low Risk**” was assigned to the Spring Gulch Allotment for the potential for physical contact between bighorn and domestic sheep under Alternatives 2, 3 and 4 when domestic sheep are present on the allotment.

The **Tank Creek Allotment** is located along the northeastern edge of the Weminuche Landscape and directly overlaps the CHHR for the West Needles Herd S-71. A boundary adjustment proposed under Alternatives 3 and 4 would eliminate the entire zone of overlap from the allotment and close this zone of overlap to domestic livestock grazing. Domestic sheep grazing began in the Tank Creek Allotment in the early 1900's. A range analysis in 1991 indicated the Tank Creek Allotment was being overgrazed in some areas, while other areas were not being impacted. A little less than one quarter of the allotment along its northern boundary is within the Weminuche Wilderness. About 60% of the allotment is either too steep or produces too little forage to be suitable for grazing. Most of the suitable grazing range is located at the higher elevations near or above timberline, and in old spruce-fir harvest areas.

Under current configuration (Alternative 2) about 12% of the allotment overlaps with the S-71 CHHR. All of the overlap area is on the east side of the Animas River. There is no mapped summer concentration area within the area of mapped overlap. Under Alternatives 3 and 4, this area of overlap with the S-71 CHHR would be removed from the allotment and closed to domestic livestock grazing. Bighorn sheep have not been reported in the allotment during the summer grazing season. Under Alternatives 3 and 4, the closest distance from the Tank Creek Allotment to the West Needles Herd S-71 CHHR is 0.8 miles away.

About 59% of the allotment is suitable domestic sheep grazing range, with about 38% of the allotment being bighorn source habitat. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with about 41% of suitable domestic sheep range also bighorn summer source habitat. Much of the bighorn source habitat is in medium to small patches scattered across the allotment, but bighorn habitat patches are relatively evenly distributed across the allotment.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Tank Creek Allotment for the potential for physical contact between bighorn and domestic sheep under Alternatives 2, 3 and 4 when domestic sheep are present on the allotment.

The **Virginia Gulch Allotment** is located on the west central portion of the Weminuche Landscape. It is located between the Florida River and Lime Mesa. The entire allotment is located within the Weminuche Wilderness. There is no direct overlap with bighorn CHHR for any of the bighorn herds in the analysis area. Under current management (Alternative 2) the Virginia Gulch Allotment is an active domestic sheep allotment. Under Alternatives 3 and 4, it would remain an active domestic sheep allotment.

A reliable report of “2 nice rams” seen within ½ mile of domestic sheep occurred in mid-summer of the 2014 grazing season. This report confirms the presence of foraging bighorns within the allotment and in close proximity to domestic sheep during the summer grazing season. Domestic sheep grazing began on this allotment in the early 1900’s.

About 57% of the Virginia Gulch Allotment is suitable domestic sheep grazing range. There is a similar amount of bighorn source habitat in the allotment, about 58% of the allotment. There is substantial overlap between suitable domestic sheep range and bighorn summer source habitat, with 57% of suitable domestic sheep range also bighorn summer source habitat. Larger blocks of bighorn source habitat occur in the northeast and northwest portions of the allotment. The shortest distance to the nearest bighorn CHHR, Vallecito Creek Herd S-28, is 2.2 miles away.

Based on information presented in the Risk Assessment a rank of “**High Risk**” was assigned to the Virginia Gulch Allotment for the potential for physical contact between bighorn and domestic sheep under Alternatives 2, 3 and 4 when domestic sheep are present on the allotment.

Direct and Indirect Effects

Table 8, below, compares the relative rankings of the three action alternatives (Alternatives 2, 3 and 4) proposed in the EIS and no action alternative based on multiple measures of quantitative and qualitative analysis factors for preventing physical contact between bighorn and domestic sheep.

As displayed in Table 8, below, the only Alternative that completely prevents physical contact between bighorn sheep and domestic sheep authorized to graze in the Weminuche Landscape is Alternative 1. Alternatives 4, 3 and 2, respectively and in the order of best to least, minimize the potential for physical contact between the species.

Alternative 1 –No Action

Selecting Alternative 1, the no action alternative, would be wholly and entirely beneficial for bighorn sheep because domestic sheep grazing would not be re-authorized on NFS lands in the Weminuche Landscape. All 13 allotments in the analysis area would be closed to domestic livestock grazing. With no domestic sheep grazing there would be no risk for physical contact between bighorn and domestic sheep resulting from livestock grazing activities authorized by the Columbine Ranger District in the Weminuche Landscape, with no subsequent potential for disease transmission from authorized livestock, and no potential for a subsequent bighorn mortality event from contact with authorized livestock. Under Alternative 1 there would be no overlap between bighorn CHHR and active or vacant domestic sheep allotments. There would be no overlap between domestic sheep suitable grazing ranges and bighorn summer source habitats. There would be no potential for forage competition between bighorn and domestic sheep.

Alternative 1 is the only alternative that completely prevents physical contact between bighorn sheep and domestic sheep authorized by the Columbine Ranger District to graze on NFS lands in the Weminuche Landscape because this alternative does not authorize domestic sheep grazing in the Landscape. In comparison, Alternatives 2, 3 and 4 all result in some potential for physical contact between the species because domestic sheep would continue to be permitted to graze some portions of NFS lands within the Landscape. The relative risk for physical contact between the species, and the area within the Weminuche Landscape where there is some potential for physical contact decreases substantially from Alternative 2 to Alternative 3, and again substantially decreases from Alternative 3 to Alternative 4, respectively.

Table 8. Relative ranking of alternatives based on multiple measures of separation between domestic sheep and bighorn sheep.

Alternative	Active, Vacant or Forage Reserve Allotments Overlap With Bighorn CHHR* Acres (% of Landscape)	Suitable Domestic Sheep Grazing Range in Active, Vacant or Forage Reserve Allotments Acres (% of Grazing Range)	Bighorn Summer Source Habitat in Active, Vacant or Forage Reserve Allotments Acres (% of Habitat)	Bighorn Summer Source Habitat Overlap With Suitable Domestic Sheep Grazing Range Acres (% of Habitat)	Average Distance from Allotments to Bighorn CHHR's*	Number of Allotments Ranked High Risk for Physical Contact	Average Years to Allotment Contact, from Risk of Contact Tool	Relative Ranking of Alternatives for Preventing Contact between Domestic Sheep and Bighorn Sheep
1	0	0	0	0	N/A	0	N/A	1
2	*46,053 (28%)	57,984 (100%)	82,151 (100%)	20,666 (100%)	6.7 miles	11	3.0 Years	4
3	0	28,629 (49%)	37,591 (46%)	12,333 (60%)	7.4 miles	6	6.7 Years	3
4	0	24,700 (43%)	18,758 (23%)	10,082 (49%)	9.0 miles	3	9.4 Years	2

Rank Order: 1 = Greatest prevention of contact, 4 = Least prevention of contact.

CHHR: Bighorn Core Herd Home Range

*CHHR intersects with active or vacant Allotment(s)

Alternative 2 (Current Management):

Selecting Alternative 2 results in some potential for physical contact between the species because domestic sheep would continue to be permitted to graze some portions of NFS lands within the Landscape and most remaining NFS lands would be available for restocking. The relative risk for physical contact between the species, and the area within the Weminuche Landscape where there is some potential for physical contact decreases substantially from Alternative 2 to Alternative 3, and again substantially decreases from Alternative 3 to Alternative 4, respectively.

Selecting Alternative 2 would be the least beneficial for bighorn sheep, compared to selecting Alternatives 1, 3 or 4, in that order. Selecting Alternative 2 would have both neutral and negative effects for bighorn sheep. Selecting Alternative 2 would have neutral effects for bighorn sheep because current domestic sheep management practices would maintain current habitat capability for bighorn sheep across much of the landscape. Alternative 2 would also have negative effects for bighorn sheep, compared to Alternative 1, because localized areas would continue to be affected by domestic sheep grazing activities, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones and wet meadows, and upland willow stands in alpine basins.

Under Alternative 2, there would continue to be about 46,053 acres of direct overlap between bighorn sheep CHHR and allotments authorized for domestic sheep grazing in the Weminuche landscape. Six of the 13 allotments would continue to overlap with mapped bighorn CHHR (Canyon Creek, Cave Basin, Flint Creek, Pine River, Rock Creek and Tank Creek). Because of direct overlap with bighorn CHHR these six allotments were rated as having “High Risk” for physical contact between domestic sheep and bighorn sheep. Of these six allotments, one is active (Tank Creek) and five are vacant (Canyon Creek, Cave Basin, Flint Creek, Pine River and Rock Creek; Table 34, above). The five vacant allotments were also rated as “High Risk” for physical contact because under Alternative 2 they would be authorized for restocking. If the five currently vacant allotments were restocked the risk of physical contact between domestic bighorn sheep would remain high with potential for disease transmission and subsequent bighorn mortality events.

Under Alternative 2, five other allotments (Endlich Mesa, Fall Creek, Johnson Creek, Leviathan and Virginia Gulch) are in close proximity to bighorn CHHR’s (generally less than about 2.2 miles). These five allotments were also given a rating of “High Risk” for physical contact between bighorn and domestic sheep due to expected high percentages of bighorns on a foray predicted to reach the allotment from the nearby CHHR (O’Brien et al. 2014, USDA Forest Service 2010c). Due to predicted high rates of reaching the allotment and good distribution of bighorn summer source habitats within the allotment there is also high risk for physical contact between the species within the allotments. These five allotments also had generally good connectivity across bighorn summer source habitats from the allotment to bighorn CHHR. One allotment (Burnt Timber) was rated “Moderate Risk” for physical contact due to substantial separation from bighorn CHHR’s and fair to poor connectivity with CHHR’s via bighorn source habitat within and near the allotment that might facilitate foraging bighorns reaching the allotment. One allotment (Spring Gulch) was rated “Low Risk” for physical contact due to substantial separation from bighorn CHHR’s and poor connectivity with CHHR’s via bighorn source habitat within and near the allotment that might facilitate foraging bighorns reaching the allotment.

Under Alternative 2 there is higher risk for physical contact between bighorn and domestic sheep in many areas because there is much more bighorn sheep summer source habitat than domestic sheep suitable grazing range, and there is substantial overlap between these areas. Under this alternative there is about 57,984 acres of suitable domestic sheep grazing range in allotments that would be authorized for domestic sheep grazing, about 36% of the total NFS acres in the

Weminuche Landscape (162,599 acres). Also under this alternative there is about 82,151 acres of bighorn summer source habitat, about 51% of the NFS acres in the Landscape. Of the 57,984 acres of suitable domestic sheep grazing range, 20,666 acres (36%) is also mapped as bighorn sheep summer source habitat. Because there is a relatively high amount (about 36%) of suitable domestic sheep grazing range overlapping with bighorn summer source habitat, this indicates higher likelihood that foraging bighorns reaching an allotment might find and contact domestic sheep on suitable range within an allotment.

Under Alternative 2, areas of overlap between suitable domestic sheep grazing range and known bighorn sheep use areas, summer concentration areas and production areas would remain in the Landscape, with high risk for physical contact between the species in these areas. For the reasons stated in the previous paragraphs, Alternative 2 does not appear to meet the desired condition for bighorn sheep. For these same reasons, Alternative 2 may not meet Forest Plan direction to prevent contact between bighorn and domestic sheep.

Alternative 3 (Adaptive Management with Forage Reserves):

Selecting Alternative 3 results in some potential for physical contact between the species because domestic sheep would continue to be permitted to graze some portions of NFS lands within the Landscape. The relative risk for physical contact between the species, and the area within the Weminuche Landscape where there is some potential for physical contact decreases substantially from Alternative 2 to Alternative 3, and again substantially decreases from Alternative 3 to Alternative 4, respectively.

Selecting Alternative 3 would be much more beneficial for bighorn sheep than selecting Alternative 2, but less beneficial than selecting Alternatives 1 or 4, in that order. Under Alternative 3, all areas of direct overlap with bighorn CHHR would be closed to domestic sheep grazing, including all of three vacant sheep allotments (Cave Basin, Flint Creek and Pine River). In addition, the three remaining allotments that overlap with bighorn CHHR under Alternative 2 (Canyon Creek, Rock Creek and Tank Creek), would have those portions of the allotment where overlap occurred under Alternative 2 removed from the allotment and closed to domestic sheep grazing under Alternative 3. For this reason, under the allotment configuration proposed in Alternative 3, no areas of direct overlap between bighorn CHHR and domestic sheep allotments would remain in the Weminuche Landscape.

Selecting Alternative 3 would be much more beneficial for bighorn sheep than selecting Alternative 2, but less beneficial than selecting Alternative 1. Alternative 3 would be less beneficial for bighorn sheep than Alternative 1 because three active allotments rated as high risk for physical contact (Endlich Mesa, Tank Creek and Virginia Gulch) and three forage reserve allotments also rated as high risk for physical contact and in close proximity to bighorn CHHR (Johnson Creek, Leviathan and Rock Creek) would remain open and available to domestic sheep grazing under Alternative 3.

Selecting Alternative 3 would be much more beneficial for bighorn sheep than selecting Alternative 2 because four vacant sheep allotments available for restocking under Alternative 2 (Cave Basin, Fall Creek, Flint Creek and Pine River) would be closed to sheep grazing under Alternative 3. These four allotments would have high risk for physical contact between the species if they were stocked with domestic sheep under Alternative 2, but would be closed to domestic sheep grazing under Alternative 3. Under Alternative 3 there would be no potential for physical contact between domestic and bighorn sheep in these four allotments resulting from actions authorized by the Columbine Ranger District and the project's desired condition for bighorn sheep would be met in these four allotments.

Compared to Alternative 2, the application of adaptive management strategies and design criteria under Alternative 3 (see EIS Tables 2-2 and 2-3) are expected to result in more rapid improvements in habitat conditions in those localized areas where sheep grazing impacts are currently occurring because adaptive management strategies would not be fully applied under Alternative 2. Although more rapid improvement in habitat conditions for bighorn sheep is expected under Alternative 3 than under Alternative 2, improvements in habitat conditions as a result of the adaptive management approach are likely to be too small to affect bighorn sheep populations or the total amount of habitat available for bighorn sheep in the Weminuche Landscape.

Under Alternative 3 there is risk for physical contact between bighorn and domestic sheep in many areas because there is more bighorn sheep summer source habitat than domestic sheep suitable grazing range, and there is substantial overlap between these areas. Under this alternative there is about 28,629 acres of suitable domestic sheep grazing range in allotments that would be authorized for domestic sheep grazing, about 18% of the total NFS acres in the Weminuche Landscape (162,599 acres). Also under Alternative 3 there is about 37,591 acres of bighorn summer source habitat, about 23% of the NFS acres in the Landscape. Of the 28,629 acres of suitable domestic sheep grazing range, 12,333 acres (43%) is also mapped as bighorn sheep summer source habitat. Because there is a relatively high amount of suitable domestic sheep grazing range overlapping with bighorn summer source habitat (about 43%), this indicates higher likelihood that foraging bighorns reaching an allotment might find and contact domestic sheep on suitable range within the allotments.

Selecting Alternative 3 would be expected to have some positive effects on forage conditions for bighorn sheep. Selecting Alternative 3 would maintain the continued gradual long term improvement in forage habitat conditions for bighorn sheep that has occurred for the past 40+ years, but probably at a slower rate than would have occurred under Alternative 1. The amount of bighorn source habitat available for domestic sheep grazing in the Weminuche Landscape under Alternative 3 would be reduced to about 46% of that under Alternative 2. Therefore selecting Alternative 3 would reduce by 54% the amount of area where forage overlap between domestic and bighorn sheep could potentially occur, and as the number of domestic sheep on the landscape has declined, so too has the risk for physical contact between domestic and bighorn sheep and thus the potential for subsequent disease transmission and potential for bighorn mortality event has also declined.

Alternative 4 (Adaptive Management/Closing Vacant Allotments – Preferred Alternative):

Selecting Alternative 4 results in some potential for physical contact between the species because domestic sheep would continue to be permitted to graze some portions of NFS lands within the Landscape. The relative risk for physical contact between the species, and the area within the Weminuche Landscape where there is some potential for physical contact decreases substantially from Alternative 2 to Alternative 3, and again substantially decreases from Alternative 3 to Alternative 4, respectively.

Under Alternative 4, all portions of the three sheep forage reserve allotments proposed under Alternative 3 (Johnson Creek, Leviathan and Rock Creek) would be entirely closed to all livestock grazing. The single allotment with a “Low Risk” rating under Alternatives 2 and 3 (Spring Gulch) would remain “Low Risk” under Alternative 4, and the two allotments with a “Moderate Risk” rating under Alternative and 3 (Burnt Timber and Canyon Creek) would remain “Moderate Risk” under Alternative 4. The three remaining allotments rated as “High Risk” under Alternatives 2 and 3 (Endlich Mesa, Tank Creek and Virginia Gulch) would remain “High Risk” under alternative 4, due to proximity with bighorn CHHR and connectivity with CHHR’s via bighorn source habitat within and near the allotment that could facilitate foraging bighorns reaching the allotment.

Under Alternative 4 there is risk for physical contact between bighorn and domestic sheep in many areas because there are relatively similar amounts of bighorn sheep summer source habitat and domestic sheep suitable grazing range, and there is substantial overlap between these areas. Under Alternative 4 there is about 24,700 acres of suitable domestic sheep grazing range in allotments that would be authorized for domestic sheep grazing, about 15% of the total NFS acres in the Weminuche Landscape (162,599 acres). Also under Alternative 4 there is about 18,758 acres of bighorn summer source habitat, about 12% of the NFS acres in the Landscape. Of the 24,700 acres of suitable domestic sheep grazing range, 10,082 acres (41%) is also mapped as bighorn sheep summer source habitat. Because there is a relatively high amount of suitable domestic sheep grazing range overlapping with bighorn summer source habitat (about 41%), this indicates a likelihood that foraging bighorns reaching an allotment might find and contact domestic sheep on suitable range within the allotments.

Under Alternative 2, there is a total of about 46,053 acres of overlap between six active and vacant domestic sheep grazing allotments and three bighorn CHHR's (S-71, S-28, and S-16) in the Weminuche Landscape. All of these areas of overlap with bighorn CHHR are proposed to be closed to sheep grazing under Alternatives 3 and 4.

Under Alternative 2, there is about 57,984 acres of suitable domestic sheep grazing range in the Weminuche Landscape). Under the allotment configuration proposed in Alternative 3, the amount of suitable sheep grazing range in active and forage reserve allotments would be reduced to about 28,629 acres by closure of four vacant sheep allotments, about 49% of that available under Alternative 2. Under Alternative 4, suitable sheep grazing range would be somewhat further reduced by closure of the three vacant sheep forage reserve allotments, to about 24,700 acres, or about 43% of that available under Alternative 2.

It is important to note that the areas of suitable domestic sheep grazing range proposed for closure under Alternatives 3 and 4 are in vacant allotments, or in areas of the active allotments that have been rarely used. Fall Creek and the three forage reserve allotments (Johnson Creek, Leviathan and Rock Creek) have all remained vacant since 1970. Flint Creek Allotment has remained vacant since 1972, and the Pine River Allotment has remained vacant since 1980. No currently active allotments would be closed under any of the action alternatives. For these reasons the amount of useable domestic sheep grazing range in active allotments would change very little (less than 1% change) between the three action alternatives.

Under Alternative 4, 77% of bighorn source habitats in the Landscape would be removed from domestic sheep grazing opportunities, compared to only 54% under Alternative 3. Under Alternative 4, 51% of bighorn source habitat that overlaps with suitable domestic sheep range would be removed from domestic sheep grazing opportunities, compared to only 40% under Alternative 3. For these reasons Alternative 4 provides a much greater level of separation between bighorn and domestic sheep grazing areas, compared to Alternatives 3 and 2.

Because Alternative 4 would retain nearly all grazing opportunities (less than 1% change) on currently active domestic sheep allotments, Alternative 4 would retain the current condition for domestic sheep permittees and meet agency direction for providing livestock grazing opportunities on NFS lands. Because Alternative 4 closes all currently vacant allotments it meets Plan direction to prevent physical contact between bighorn and permitted domestic sheep on the closed allotments. Because Alternative 4 closes more vacant allotments than Alternatives 3 and 2, Alternative 4 is more likely than Alternative 3 or Alternative 2 to provide for long-term bighorn persistence within a landscape that retains current domestic sheep grazing opportunities on active allotments.

Under Alternative 4, the average distance from allotments to the nearest bighorn CHHR is 9.0 miles, with no direct overlap with bighorn CHHR and only three sets of allotment/bighorn herd combinations within close proximity to bighorn CHHR's. Under Alternative 3, the average distance from allotments to the nearest bighorn CHHR is 7.4 miles, with no direct overlap with bighorn CHHR and six sets of allotment/bighorn herd combinations within close proximity to bighorn CHHR's. Under Alternative 2, the average distance to the nearest bighorn CHHR is 6.7 miles, with 14 sets of allotment/bighorn herd combinations either in direct overlap or within close proximity (within about 2.2 miles). Therefore Alternative 4 provides the greatest level of physical separation between bighorn and domestic sheep use areas, compared to Alternatives 3 and 2. For the same reasons, Alternative 4 provides the best opportunity for preventing contact between the species, compared to Alternatives 3 and 2.

Under Alternative 4 a total of three allotments receive a rank of "High Risk" for the potential for physical contact between bighorn and domestic sheep. Under Alternative 3, this is increased to six allotments. Under Alternative 2, a total of 11 allotments receive a rank of "High Risk" for physical contact between bighorn and domestic sheep. Therefore there is a substantial reduction in the number of allotments and areas of concern for potential for physical contact between bighorn and domestic sheep under Alternatives 4 and 3, compared to Alternative 2. In addition, the areas of concern ("High Risk") are much smaller under Alternative 4 than under Alternative 3.

Based on results of the Risk of Contact Tool, Alternative 4 provides substantially greater spatial and temporal separation between bighorn and domestic sheep than that provided under Alternatives 3 and 2. The allotment boundary adjustments and allotment closures proposed to occur under Alternative 4 would substantially reduce the estimated rate of allotment contact by bighorns foraging outside their CHHR, compared to the same rates under Alternatives 3 and 2.

For the reasons discussed in the paragraphs above, Alternative 4 provides greater separation between bighorn sheep and domestic sheep than Alternatives 3 or 2, while also having little effect on the amount of domestic sheep grazing acres in currently active allotments (less than 1% change). Therefore Alternative 4 provides substantial benefits for bighorn sheep, much more than under Alternative 2 and more than Alternative 3, while continuing to provide existing domestic sheep permittees with the same amount of grazing range as in currently active allotments.

For all the reasons discussed in the preceding paragraphs, the order of alternatives most beneficial for bighorn sheep is Alternative 1, followed by Alternative 4, Alternative 3, and Alternative 2. For most of the quantitative and qualitative factors discussed above, Alternative 4 provides substantially greater physical separation between bighorn and domestic sheep than Alternative 3, which provides substantially greater physical separation than Alternative 2. This is accomplished while continuing to provide existing domestic sheep permittees with similar amounts of domestic sheep grazing range as in currently active allotments.

Cumulative Effects

See cumulative effects discussion below.

For the reasons stated in this analysis it is my determination that Alternative 2 “**may adversely impact individual Rocky Mountain bighorn sheep and is likely to result in a loss of viability on the planning area, in a trend to federal listing, or in a loss of species viability rangewide**”. It is also my determination that Alternatives 3 and 4 “**may adversely impact individual but is not likely to result in a loss of viability in the planning area nor cause a trend toward federal listing, or loss of species viability rangewide.**”

Effects of Selecting Alternative 1 (all Sensitive Species) – No Grazing

Alternative 1, the no action alternative, would be wholly beneficial for all designated sensitive species because livestock grazing would not be re-authorized in the Weminuche Landscape. There would be no impact on habitats used by sensitive species, or impacts to individual animals from selecting Alternative 1. There would be no potential impacts from livestock grazing activities to key habitat components for sensitive species. Selection of Alternative 1 has the potential to provide direct benefits to sensitive species but the degree of benefit for most sensitive species would probably be small in any given year and limited in scale to those locations on the landscape where livestock grazing is currently affecting habitat conditions for sensitive species. In most areas, benefits to sensitive species from selecting Alternative 1 would probably take a number of years to be detectible, but benefits would probably be long term (> 10 years).

Benefits to designated sensitive species from selecting Alternative 1 would be most pronounced for Rocky Mountain bighorn sheep in the Vallecito Creek Herd S-28, West Needles Herd S-71 and Cimarrona Peak Herd S-16 by removing areas with potential for contact between bighorn sheep and domestic sheep authorized to graze within the Weminuche landscape. Because sheep grazing would not be reauthorized there would be no potential for disease transmission between the species from contact with livestock authorized to graze within the landscape. Selecting Alternative 1 would also benefit bighorn sheep by removing the possibility of forage competition between bighorns and domestic sheep. The benefits of selecting Alternative 1 would be long term (> 10 years) and cover extensive areas of bighorn sheep core herd home ranges (about 46,053 acres). Benefits would also come from gradual, long term improvements in the condition of moist alpine areas adjacent to riparian zones or wet meadows. However, these potential habitat improvements would be limited to those localized areas where current domestic sheep utilization levels are high and impacts to soil and vegetation are occurring.

Benefits to white-tailed ptarmigan would be primarily in improved condition of summer/fall foraging areas in alpine basins, but these improvements would likely be limited in scope because upland willow stands where browsing impacts were observed were localized and not widespread. In addition, it was difficult to determine with certainty whether the browsing observed on these willows was from domestic sheep, elk, or a combination of both.

Effects of Selecting Alternative 2 (all Sensitive Species) – Current Management

Selecting Alternative 2 would have both neutral and negative effects for sensitive species. Selecting Alternative 2 would have neutral effects for sensitive species because current sheep management practices would continue and current habitat capability for sensitive species would likely be maintained across much of the Landscape. Alternative 2 would also have negative effects for sensitive species, compared to Alternative 1, because localized areas would continue to be affected by sheep grazing activities, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones and wet meadows, and upland willow stands in alpine basins.

Selection of Alternative 2 is expected to result in continued gradual improvement in habitat conditions for sensitive species, but at a slower rate than would have occurred under Alternative 1. Habitat conditions for bighorn sheep and white-tailed ptarmigan are expected to continue to gradually improve under Alternative 2, assuming that the historic trend of reduced numbers of domestic sheep grazed on the San Juan National Forest over the past 40+ years continues. Numbers of domestic sheep permitted to graze in the Weminuche Landscape have dropped about 62% from a high of between about 10,300 and 11,500 animals from the 1940's through the 1970's, down to about 4,400 currently. In addition, numbers of sheep permitted to graze on the San Juan NF have dropped about 95% from a high of about 216,600 animals in the 1930's to about 10,800 currently. As numbers of sheep have declined in the Weminuche Landscape and on the entire National Forest, habitat conditions for bighorn sheep and the potential for contact and subsequent disease transmission between bighorns and domestic sheep has also declined. Even if numbers of domestic sheep remain relatively stable over the next few (5+) years, a continued gradual improvement in bighorn sheep forage conditions and white-tailed ptarmigan summer/fall habitat areas would be expected under Alternative 2. This is because at current domestic sheep stocking levels, the observed gradual improvement in alpine plant communities is expected to continue over the next few years.

Selecting Alternative 2 would have negative effects for bighorn sheep, compared to Alternative 1, because the allotments where there is currently direct overlap between domestic sheep and bighorn CHHR would remain available for grazing by domestic sheep, thereby maintaining high potential for physical contact between domestic and bighorn sheep.

Selecting Alternative 2 would be generally neutral for white-tailed ptarmigan, and much less beneficial than selecting Alternative 1 because improvement in habitat conditions would probably occur over a longer time frame than under Alternative 1. Under Alternative 2, habitat conditions for ptarmigan would continue to be impacted in localized areas causing continued degraded habitat conditions in these generally small and localized areas. Under Alternative 2, about one third of ptarmigan habitat in the Landscape would continue to be affected by domestic sheep grazing. A continued gradual improvement in ptarmigan forage and cover conditions within summer and fall foraging areas would be expected under Alternative 2 even if numbers of domestic sheep remained relatively stable over the next few (5+) years.

Selecting Alternative 2 would be neutral for wolverine due to the relatively low numbers of domestic sheep, compared to past decades, would likely continue on the Landscape for the foreseeable future. Selecting Alternative 2 would be less beneficial for wolverine than selecting Alternative 1 because improvements in alpine habitat conditions would likely occur over a much longer time frame than under Alternative 1. This is because impacts associated with sheep grazing would continue under Alternative 2. However, if the historic trend (1970's and 1980's) of declining numbers of domestic sheep permitted to graze in the Landscape continued in the future, wolverine habitat conditions could be expected to gradually improve over time under Alternative 2.

Effects of Selecting Alternative 3 (all Sensitive Species) – Forage Reserves

Selecting Alternative 3 would be generally beneficial for sensitive species, although less than under Alternative 1, but more so than selecting Alternative 2. The improvements in habitat conditions for sensitive species expected to occur over time under Alternative 3 are likely to be generally small and limited to localized areas where habitat conditions are being degraded by sheep grazing activities under current management practices.

Selecting Alternative 3 would have both positive and negative effects for sensitive species. Selecting Alternative 3 would have beneficial effects for sensitive species, compared to Alternative 2, because

application of adaptive management strategies and design criteria is expected to result in more rapid improvements in habitat conditions in those localized areas where sheep grazing impacts to habitats for sensitive species are currently occurring. Selecting Alternative 3 would have negative effects for sensitive species, compared to Alternative 1, because those localized areas of sheep grazing impacts would continue to be affected by sheep grazing activities, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins.

Selecting Alternative 3 would be more beneficial for sensitive species than selecting Alternative 2, but would be less beneficial than selecting Alternative 1. This is because improvement in habitat conditions would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than Alternative 2 due to the application of adaptive management strategies and design criteria. In general, habitat conditions for sensitive species are expected to continue to gradually improve in most areas under Alternative 3, but localized impacts would continue to occur in some generally small and localized areas within active allotments.

Compared to Alternative 2, the application of adaptive management strategies and design criteria under Alternative 3 should result in more rapid improvements in habitat conditions in those localized areas where sheep grazing impacts are currently occurring because adaptive management strategies would not be fully applied under Alternative 2. Although more rapid improvement in habitat conditions for bighorn sheep, white-tailed ptarmigan and wolverine is expected under Alternative 3 than under Alternative 2, improvements in habitat conditions as a result of the adaptive management approach are likely to be too small to affect populations or the total amount of habitat available for these species in the Weminuche Landscape.

Selecting Alternative 3 would be much more beneficial for bighorn sheep than selecting Alternative 2, although less so than selecting Alternative 1. Alternative 3 would be less beneficial for bighorn sheep than Alternative 1 because four active allotments and three forage reserve allotments in close proximity to bighorn sheep CHHR would remain open to domestic sheep grazing under Alternative 3.

Alternative 3 would be much more beneficial for bighorn sheep than Alternative 2. This is because four vacant sheep allotments available for restocking under Alternative 2 (Cave Basin, Fall Creek, Flint Creek and Pine River) would be permanently closed to sheep grazing under Alternative 3. These four allotments would have "High Risk" for physical contact between the species if they were stocked with domestic sheep under Alternative 2, but would be closed to domestic sheep grazing under Alternative 3. The potential for physical contact between permitted domestic sheep and bighorn sheep in these four allotments would be removed and the project's desired condition for bighorn sheep would be met in these four allotments.

Selecting Alternative 3 would be expected to have some positive effects on forage conditions for bighorn sheep. Selecting Alternative 3 would maintain the continued gradual long term improvement in forage habitat conditions for bighorn sheep that has occurred for the past 40+ years, but probably at a slower rate than would have occurred under Alternative 1. The amount of bighorn source habitat available for grazing in the Weminuche Landscape under Alternative 3 would be reduced to about 46% of that under Alternative 2. Therefore selecting Alternative 3 would reduce the amount of area where forage overlap between domestic and bighorn sheep could potentially occur. And, as the number of domestic sheep on the landscape has declined, so too has the risk for physical contact between domestic and bighorn sheep and thus the potential for subsequent disease transmission and potential for bighorn mortality event has also declined.

Even if numbers of domestic sheep remain relatively stable over the next few (5+) years, a continued gradual improvement in bighorn sheep forage conditions and white-tailed ptarmigan

summer/fall habitat areas would be expected under Alternative 3. This is because at current domestic sheep stocking levels, the observed gradual improvement in alpine plant communities is expected to continue, and the application of design criteria and adaptive management strategies would further reduce affects from domestic sheep grazing.

Selecting Alternative 3 would be beneficial for white-tailed ptarmigan, although less beneficial than selecting Alternative 1, but more beneficial than selecting Alternative 2. The localized areas currently affected by sheep grazing within active allotments would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones and wet meadows, and upland willow stands in alpine basins and on ridgelines. Although more rapid improvement in habitat conditions for ptarmigan is expected under Alternative 3 than under Alternative 2, improvements due to adopting the adaptive management approach are likely to be too small to affect ptarmigan populations or the total amount of habitat available in the Weminuche Landscape.

Selecting Alternative 3 would be generally beneficial for wolverine, although less so than selecting Alternative 1, but more so than selecting Alternative 2. Benefits to wolverine from selecting Alternative 3 would likely be limited to the localized areas in active allotments where sheep grazing practices are affecting alpine habitats. Compared to Alternative 2, selecting Alternative 3 would have beneficial effects for wolverine because application of adaptive management strategies and design criteria are expected to result in more rapid improvements in alpine habitat conditions in the areas where sheep grazing is affecting those conditions.

Effects of Selecting Alternative 4 (all Sensitive Species) – Preferred Alternative

Selecting Alternative 4 would be mostly beneficial for sensitive species, although less so than selecting Alternative 1, but more so than selecting Alternative 3, and much more so than selecting Alternative 2. The improvements in habitat conditions for sensitive species expected to occur over time under Alternative 4 are likely to be generally small and limited to those generally small and localized areas where habitat conditions are being affected by sheep grazing activities under current management practices.

Selecting Alternative 4 would have both positive and negative effects for sensitive species. Selecting Alternative 4 would have more beneficial effects for sensitive species than selecting Alternative 2 because application of adaptive management strategies and design criteria is expected to result in more rapid improvements in habitat conditions in those localized areas where sheep grazing impacts to sensitive species habitats are currently occurring. Selecting Alternative 4 would have negative effects for sensitive species, compared to Alternative 1, because those localized areas in active allotments where sheep grazing impacts are occurring would continue to be affected by sheep grazing activities, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones or wet meadows, and upland willow stands in alpine basins.

Selecting Alternative 4 would be more beneficial for sensitive species than selecting Alternative 3 and much more beneficial than selecting Alternative 2, but would be less beneficial than selecting Alternative 1. This is because improvement in habitat conditions for sensitive species would probably occur over a longer time frame than under Alternative 1, but a shorter time frame than Alternative 3 or Alternative 2 due to the application of adaptive management strategies and design criteria. This is because adaptive management strategies would not be fully applied under Alternative 2. In general, habitat conditions for sensitive species are expected to continue to gradually improve in most areas under Alternative 4, but localized impacts would continue to occur in some areas where sheep grazing would continue under Alternative 4. However, improvements in habitat conditions for sensitive species as a result of the adaptive management approach are likely to be too small to affect populations or the total amount of habitat available for

these species in the Weminuche Landscape.

Selecting Alternative 4 would be much more beneficial for bighorn sheep than selecting Alternative 2, more beneficial than selecting Alternative 3, but less beneficial than selecting Alternative 1. Alternative 4 would be less beneficial for bighorn sheep than Alternative 1 because four active allotments in close proximity to bighorn sheep CHHR would remain open to domestic sheep grazing under Alternative 4.

Alternative 4 would be more beneficial for bighorn sheep than Alternative 3 because three sheep forage reserve allotments available for grazing up to three years out of every ten under Alternative 3 (Johnson Creek, Leviathan and Rock Creek) would be permanently closed to sheep grazing under Alternative 4. These three allotments would have “High Risk” for physical contact between the species if they were stocked with domestic sheep under Alternative 3, but would be closed to sheep grazing under Alternative 4. The potential for physical contact between permitted domestic sheep and bighorn sheep in the three forage reserve allotments would be removed and the project’s desired condition for bighorn sheep would be met in these three allotments.

Selecting Alternative 4 would be expected to have some positive effects on forage conditions for bighorn sheep. Selecting Alternative 4 would maintain the continued gradual long term improvement in forage habitat conditions for bighorn sheep that has occurred for the past 40+ years, but probably at a slower rate than would have occurred under Alternative 1. The amount of bighorn source habitat available for grazing in the Weminuche Landscape under Alternative 4 would be reduced to about 23% of that under Alternative 2, and 23% less than under Alternative 3. Therefore selecting Alternative 4 would reduce the amount of area where forage overlap between domestic and bighorn sheep could potentially occur. And, as the number of domestic sheep on the landscape has declined, so too has the risk for physical contact between domestic and bighorn sheep and thus the potential for subsequent disease transmission and potential for bighorn mortality event has also declined.

Even if numbers of domestic sheep remain relatively stable over the next few (5+) years, a continued gradual improvement in habitat conditions for sensitive species would be expected under Alternative 4. This is because at current domestic sheep stocking levels, the observed gradual improvement in alpine plant communities is expected to continue, and the application of design criteria and adaptive management strategies would further reduce affects from domestic sheep grazing.

Selecting Alternative 4 would be more beneficial for white-tailed ptarmigan than Alternative 3 and much more beneficial than Alternative 2, but less beneficial than selecting Alternative 1. The generally small and localized areas currently affected by sheep grazing in active allotments would continue to be affected, such as near the alpine/spruce-fir interface, moist alpine areas adjacent to riparian zones and wet meadows, and upland willow stands in alpine basins and on ridgelines. Although more rapid improvement in habitat conditions for ptarmigan is expected under Alternative 4 than under Alternative 2, improvements due to adopting the adaptive management approach are likely to be too small to affect ptarmigan populations or the total amount of habitat available in the Weminuche Landscape. Alternative 4 would close the three forage reserve allotments proposed under Alternative 3 and thus the gradual improvement in habitat conditions in the forage reserve allotments would continue.

Selecting Alternative 4 would be generally beneficial for wolverine, more so than selecting Alternative 3, and much more so than selecting Alternative 2. However, selecting Alternative 4 would be less beneficial than selecting Alternative 1. Under Alternative 4, only about 15% of alpine habitats would be in areas suitable for domestic sheep grazing. There would be no forage reserves

authorized under Alternative 4. The total of 15% of alpine habitats in areas suitable for sheep grazing under Alternative 4 compares to 18% under Alternative 3, and 33% under Alternative 2.

Benefits to wolverine from selecting Alternative 4 are likely to be limited to the localized areas in the currently active allotments where sheep grazing practices are affecting alpine habitats. Selecting Alternative 4 would have some beneficial effects because application of adaptive management strategies and design criteria should result in more rapid improvements in alpine habitat conditions in the areas where sheep grazing is currently affecting those conditions.

The Weminuche Landscape is located adjacent to a region that is documented as providing an important connectivity area for forest carnivores (e.g. lynx) moving east/west through the central San Juan Mountains (Schultz et al. 2006). Given the Landscape's location in relation to high use connectivity habitat areas, recognized high potential for sustaining wolverines, and the remote nature of most of the landscape especially during the most sensitive time period of wolverine ecology (denning and early kit rearing), the Landscape is likely to be important to wolverine movement and regional connectivity, if any animals were present.

Cumulative Affects for all Sensitive Species

Global climate change is an issue that is somewhat contentious with uncertainty about what likely outcomes might be. However, there is little doubt that plants and animals found almost exclusively in the alpine zone may be the first to face shrinking habitat areas as a result of changes in global climate. Most predictions about global climate change predict a gradual loss of alpine habitats as treeline moves upward in response to a generally warming climate. For white-tailed ptarmigan and wolverine, the effect of global warming has the potential to have far greater consequences than the combined effects of grazing, recreation, mining, and other human impacts. As such, global climate change may be the most serious threat to long-term persistence of ptarmigan populations in the Weminuche landscape and long-term habitat capability for wolverine. Reduced alpine snow packs and receding late-spring snow fields may reduce habitat capability for snow-dependent alpine species such as the wolverine.

Perhaps the greatest current and near-future (5- to 10-years) influence on habitat conditions for sensitive species in the Weminuche Landscape is a spruce beetle (*Dendroctonus rufipennis*) epidemic that is rapidly expanding from northern and eastern portions of the Landscape towards southern and western portions of the Landscape. Large stands of Engelmann spruce has either died or is dying, causing extensive openings in the overstory forest canopy. For example, within the past five years, the upper third of the Pine River and Vallecito Creek drainages have had extensive areas of mortality of mature Engelmann spruce trees, in some areas exceeding 80% to 90% of mature overstory trees. Within stands affected by spruce beetles, there is a high probability that most spruce trees over five inches diameter will die. Within the next five years the beetle outbreak is expected to expand down the Pine River and Vallecito Creek drainages, and is expected to increase in the upper Florida River and Missionary Ridge portions of the Weminuche Landscape.

The spruce beetle is the most significant natural mortality agent of mature spruce trees. Spruce beetle outbreaks can cause extensive tree mortality and modify stand structure by reducing the average tree diameter, height, and stand density. Infected trees often take a couple years to die, so infestations appear to be more widespread in following years. Beetles grow to adulthood inside trees and then take off to infect new trees. Most spruce-fir forests in the landscape are mature closed-canopy stands that are at risk to beetles. However, most of the spruce-fir forests in the Weminuche Landscape are mixed with subalpine fir, which are not affected by spruce beetles. For

this reason, stands with higher fir composition are less affected by beetles than stands with higher spruce composition.

The beetle epidemic has the potential to substantially alter spruce-fir habitat conditions for sensitive species, improving its forage and travel value for species such as bighorn sheep in the most heavily affected areas, and reducing its forage value for species such as American marten in the most heavily affected areas. Forage value for bighorn sheep could be greatly improved by the beetle epidemic because mortality of overstory trees is expected to substantially open the canopy of previously closed-canopy spruce stands, allowing substantial increases in forage production in the understory. In addition, in northern and eastern portions of the Landscape where many stands have already been heavily affected, bighorn mobility across the Landscape may have been substantially improved thereby increasing the potential for foraging bighorns to contact active allotments and come into physical contact with domestic sheep.

High mortality rates of mature overstory spruce trees would substantially improve the amount and connectivity of habitats for primary cavity excavator species, thereby substantially increasing the number of cavities available for sensitive species that are obligate secondary cavity nesters such as boreal owl and flammulated owl. Because woodpecker populations are expected to increase substantially in response to the ongoing beetle outbreak, similar to post-fire conditions (Winternitz 1998), habitat conditions for secondary cavity nesting sensitive species are also expected to substantially improve in the near future.

More localized threats to alpine species, including ptarmigan and bighorn sheep and species with presumed sensitivities to some human activities such as wolverine, include mining, water development, and motorized and non-motorized recreation. While alpine ecosystems are hardy and resilient to natural environmental factors, they are particularly vulnerable to human related disturbances and may require decades to recover. Although substantial progress has been made in developing techniques to restore damaged alpine landscapes, this technology is still not capable of restoring alpine plant communities to their pre-disturbance condition (Hoffman 2006).

As the number of off-highway vehicles (OHV's) continues to increase on most roads and OHV trails in and around the Weminuche Landscape, the potential for disturbance to bighorn sheep that use areas adjacent to popular OHV routes also continues to increase each year. The continual annual increase in OHV use observed over the past 5-10 years in and around the Weminuche Landscape is likely to continue for the foreseeable future. Increased motorized disturbance to bighorn sheep in places such as the Tuckerville area may cause animals to move away from preferred foraging areas and into areas with lower quality forage or areas where animals are more vulnerable to predation, leading to increased predation or mortality.

White-tailed ptarmigan populations in the southwest Colorado ore belt, roughly between Telluride, Silverton and Lake City, including some of the Weminuche Landscape, are thought to not be self-sustaining. For this reason, protecting and maintaining fall and winter habitat for adult female ptarmigan is likely to be a key factor in ensuring long-term population persistence in the Landscape. Maintenance and protection of fall and winter ptarmigan habitat is especially important given the high site fidelity of wintering birds and the considerable numbers of adult females that are attracted from surrounding breeding habitats to the few suitable wintering sites (Braun et al. 1976). Increased motorized and non-motorized recreation in preferred ptarmigan wintering areas could reduce ptarmigan winter habitat quality through increasing the extent of compacted snow areas and increased disturbance to wintering birds. Ptarmigan populations in some portions of the Weminuche Landscape may be especially vulnerable to loss or degradation of fall and winter habitat given that population densities are likely lower than other parts of the species range and may not be self-sustaining (Larison et al. 2000).

Other activities that continue to influence habitat capability for sensitive species in the Weminuche Landscape include development of private lands adjacent to public lands, and increasing levels of non-motorized recreation on many trails in the Landscape. Influences that continue to affect vegetation in the Landscape and therefore affect habitat capability for sensitive species include ongoing fire suppression, personal use firewood harvesting of standing dead trees for use as primary home heating purposes, and natural events such as wild fire, forest insect and disease outbreaks, wind throw events, and avalanches. All these activities have contributed to changes in the composition, structure, and function of forested habitats in the Landscape, and habitat for sensitive species.

LITERATURE CITED

- American Sheep Industry Association. 2011. Bighorn working session recommendations, June 14, 2011. Unpublished document. 2 pp. Available on the internet at:
http://amhealthmaster.http.internapcdn.net/AMHealthMaster/DOCUMENT/SheepUSA/bighorn_working_sessions.pdf
- Aune, K., N. Anderson, D. Worley, L. Stackhouse, J. Henderson, and J. Daniel. 1998. A comparison of population and health histories among seven Montana bighorn sheep populations. Biennial Symposium of the Northern Wild Sheep and goat Council. 11:46-69.
- Aubry, K. B., K. S. McKelvey, and J. P. Copeland. 2007. Distribution and broadscale habitat relations of the wolverine in the contiguous United States. *J. Wildl. Manage.* 71:2147-2158.
- Banci, V. 1994. Wolverine. Pages 99-127 in the scientific basis for conserving carnivores, American marten, fisher, lynx, and wolverine in the western United States. L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, tech. eds. USDA For. Serv. Gen. Tech. Rep. RM-254. Fort Collins, CO.
- Beecham, J. J., C. P. Collins, and T. D. Reynolds 2007. Rocky Mountain bighorn sheep (*Ovis canadensis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available on the internet at:
<http://www.fs.fed.us/r2/projects/scp/assessments/rockymountainbighornsheep.pdf>
- Besser, T. E. 2013. Whodunit: what causes pneumonia outbreaks in bighorn sheep? *Wild Sheep*: Fall 2013.
- Besser, T. E., E. F. Cassirer, C. Yamada, K. A. Potter, C. Herndon, W. J. Foreyt, D. P. Knowles, and S. Srikumaran. 2012a. Survival of bighorn sheep (*Ovis canadensis*) commingled with domestic sheep (*Ovis aries*) in the absence of *Mycoplasma ovipneumoniae*. *Journal of Wildlife Diseases* 48:168-172.
- Besser, T. E., M. A. Highland, K. Baker, E. F. Cassirer, N. J. Anderson, J. M. Ramsey, K. Mansfield, D. L. Bruning, P. Wolff, J. B. Smith, and J. A. Jenks. 2012b. Causes of pneumonia epizootics among bighorn sheep, Western United States, 2008-2010. *Emerging Infectious Diseases* 18:406-414.
- Besser, T. E., E. F. Cassirer, M. A. Highland, P. Wolff, A. Justice-Allen, K. Mansfield, M. A. Davis, and W. Foreyt. 2012c. Bighorn sheep pneumonia: sorting out the cause of a polymicrobial

disease. Preventive Veterinary Medicine 108:85-93.

- Besser, T. E., E. F. Cassirer, M. C. Yamada, K. A. Potter, C. Herndon, W. Foreyt, and D. P. Knowles. 2012d. Survival of bighorn sheep (*Ovis canadensis*) commingled with domestic sheep (*Ovis aries*) in the absence of *Mycoplasma ovipneumoniae*. Journal of Wildlife Diseases 48:000-000.
- Besser, T. E., E. F. Cassirer, K. A. Potter, K. Lahmers, J. L. Oaks, S. Shanthalingam, S. Srikumaran, and W. J. Foreyt. 2014. Epizootic pneumonia of bighorn sheep following experimental exposure to *Mycoplasma ovipneumoniae*. PLoS One 9:e110039.
- Boyle, S. 1998. Black swift. Pages 236-237 in Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Div of Wildlife, Denver, CO.
- Braun, C.E. 1971. Habitat requirements of Colorado white-tailed ptarmigan. Proceedings of the Western Association of State Game and Fish Commissioners 51:284-292.
- Braun, C. E., R. W. Hoffman, and G. E. Rogers. 1976. Wintering areas and winter ecology of white-tailed ptarmigan in Colorado. Colorado Division of Wildlife Spec. Rep. No. 38. W-R-S-38-'76. Denver, CO. 35 pp.
- Cahn, M. L., M. M. Conner, O. J. Schmitz, T. R. Stephenson, J. D. Wehausen, and H. E. Johnson. 2011. Disease, population viability, and recovery of endangered Sierra Nevada bighorn sheep. Journal of Wildlife Management 75:1753-1766.
- Carpenter, T. E., V. L. Coggins, C. McCarthy, C. S. O'Brien, J. M. O'Brien, and J. J. Schommer. 2014. A spatial risk assessment of bighorn sheep extirpation by grazing domestic sheep on public lands. Preventive Veterinary Medicine 114:3-10.
- Cassirer, E. F., R. K. Plowright, K. R. Manlove, P. C. Cross, A. P. Dobson, K. A. Potter, and P. J. Hudson. 2013. Spatio-temporal dynamics of pneumonia in bighorn sheep. Journal of Animal Ecology 82:518-528.
- Colorado Parks and Wildlife. 2015. Threatened and endangered list, available on the world wide web at: <http://cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx>. Accessed 10/16/2015.
- Colorado Parks and Wildlife. 2013a. Memorandum of understanding for management of domestic sheep and bighorn sheep. October 14, 2013. 4 pp.
- Copeland, J. P. 1996. Biology of the wolverine in central Idaho. M. S. Thesis, Univ. Idaho, Moscow, ID. 138 pp.
- Copeland, J. P., K. S. McKelvey, K. B. Aubry, A. Landa, J. Persson, R. M. Inman, J. Krebs, E. Lofroth, H. Golden, J. R. Squires, A. Magoun, M. K. Schwartz, J. Wilmot, C. L. Copeland, R. E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? Can. J. Zool. 88:233-246.
- Craig, G. R., and J. H. Enderson. 2004. Peregrine falcon biology and management in Colorado, 1973 – 2001. Colorado Division of Wildlife Tech. Publ. No. 43. 80 pp.
- Council for Agricultural Science and Technology (CAST). 2008. Pasteurellosis transmissino risks between domestic and wild sheep. CAST Commentary QTA 2008-1. CAST, Aimes, IA. 8 pp.

- Diamond, B. 2005. Abbreviated summary for Unit S-33, the Pole Mountain/Upper Lake Fork bighorn sheep herd. Unpublished report, Colorado Division of Wildlife, Fort Collins, CO. 6 pp.
- Drew, M. L., K. M. Rudolph, A. C. S. Ward, and G. C. Weiser. 2014. Health status and microbial (Pasteurellaceae) flora of free-ranging bighorn sheep following contact with domestic ruminants. *Wildlife Society Bulletin* 38:332-340.
- Fitzgerald, J.P., C.A. Meany, and D.M. Armstrong. 1994. *Mammals of Colorado*. Denver Museum of Natural History, and University Press of Colorado, Boulder. 467 pp.
- George, J. L., R. Kahn, M.W. Miller, and B. Watkins. 2009. Colorado Bighorn Sheep Management Plan 2009 – 2019. Colorado Division of Wildlife Special Report 81. Colorado Division of Wildlife, 6060 Broadway, Denver, CO, 80216. 88 pp.
- George, J. L., R. Kahn, M. W. Miller, and B. Watkins. 2008. Colorado bighorn sheep management plan 2008 – 2018. Colorado Division of Wildlife, 6060 Broadway, Denver, CO, 80216. 96 pp.
- Hayward, G.D., P.H. Hayward, and E.O. Garton. 1993. Ecology of Boreal Owls in the northern Rocky Mountains, USA. *Wildl. Monogr.* 124. 59 pp.
- Hammerson, G. A. 1999. *Amphibians and reptiles in Colorado, a Colorado Field guide*. University Press of Colorado, Niwot, CO. 484 pp.
- Hoffman, R. W. 2006. White-tailed ptarmigan (*Lagopus leucura*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available on line at: <http://www.fs.fed.us/r2/projects/scp/assessments/whitetailedptarmigan.pdf>
- Inman, R. M., M. L. Pakila, K. H. Inman, B. Aber, R. Spence, and D. McCauley. 2009. Greater Yellowstone wolverine program, progress report – 2009. Wildlife Conservation Society, North American Program, general report, Bozeman, MT. 32 pp.
- Jones, S. 1998. Olive-sided flycatcher. Pages 268-269 in Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Div of Wildlife, Denver, CO.
- Kennedy, P. L. 2003. Northern goshawk (*Accipiter gentiles atricapillus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available on line at: <http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf>
- Knorr, O. A. 1993. Black Swift (*Cypseloides niger*) nesting site characteristics: some new insights. *Avocetta* 17:139-140.
- Knorr, O. A. 1961. The geographical and ecological distribution of the Black swift in Colorado. *Wilson Bull.* 73:155-170.
- Larison, J. R., G. E. Likens, J. W. Fitzpatrick, and J. G. Crock. 2000. Cadmium toxicity among wildlife in the Colorado Rocky Mountains. *Nature* 406:181-183.
- Lawrence, P. K., S. Shanthlingam, R. P. Dassanayake, R. Subramianam, C. N. Herndon, D. P. Knowles, F. R. Rurangirwa, W. J. Foreyt, G. Wayman, A. M. Marciel, S. K. Highlander, and S. Srikumaran. 2010. Transmission of *Mannheimia haemolytica* from domestic sheep (*Ovis*

- aries) to bighorn sheep (*Ovis canadensis*): unequivocal demonstration with green fluorescent protein-tagged organisms. *Journal of Wildlife Diseases* 46:706-717.
- Magoun, A. J., and J. P. Copeland. 1998. Characteristics of wolverine reproductive den sites. *J. Wildl. Manage.* 62:1313-1320.
- Martin, K. D., T. J. Schommer, and V. L. Coggins. 1996. Literature review regarding the compatibility between bighorn and domestic sheep. *Proceedings of the Tenth Biennial Symposium of the Northern Wild Sheep and Goat Council* 10:72-77.
- Miller, M. W. 2011. Update on bighorn sheep vaccines. Unpublished document. 8 pp. Available on the internet at:
<http://amhealthmaster.http.internapcdn.net/AMHealthMaster/DOCUMENT/SheepUSA/update-on-bighorn-sheep.pdf>
- O'Brien, J. M., C. S. O'Brien, C. McCarthy, and T. E. Carpenter. 2014. Incorporating foray behavior into models estimating contact risk between bighorn sheep and areas occupied by domestic sheep. *Wildlife Society Bulletin* 38:321-331.
- Onderka, D. K., and W. D. Wishart. 1984. A major bighorn sheep die-off from pneumonia in southern Alberta. *Proceedings of the Fourth Biennial Symposium of the Northern Wild Sheep and Goat Council* 4:356-363.
- Quimby, C. 2005. A practical approach to adaptive management with a special focus on livestock management NEPA based decisions. Unpublished Report. USDA Forest Service, 740 Simms St, Golden, CO, 80401. 28 pp.
- Reynolds, R.T. and B.D. Linkhart. 1992. Flammulated Owls in ponderosa pine: evidence of preference for old-growth. Pages 166-169 *in* old-growth forests in the Southwest and Rocky Mountain Regions: proceedings of a workshop. U.S.D.A. Forest Service Gen. Tech. Report RM-213.
- Reynolds, R.; R. Graham; M. Hildegard; R. Bassett; P. Kennedy; D. Boyce; G. Goodwin; R. Smith; and E. Fisher. 1992 Management recommendations for the northern goshawk in the southwestern United States. U.S.D.A., Forest Service, Rocky Mountain Forest and Range Experiment Station. General Tech. Rep. RM-217. Ft. Collins, CO. 184 pp.
- Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, T. C. Will, 2004. Partners in Flight North American landbird conversation plan. Cornell Lab of Ornithology, Ithaca, NY. 84 pp.
- Ryder, R. A. 1998. Boreal owl. Pages 228-229 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Div of Wildlife, Denver, CO.
- San Juan National Forest. 2004a. Boreal owl Species Assessment for the San Juan National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 20 pp.
- San Juan National Forest. 2004b. Flammulated owl species assessment for the San Juan National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 17 pp.
- San Juan National Forest. 2004c. Northern goshawk species assessment for the San Juan

- National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 22 pp.
- San Juan National Forest. 2004d. Olive-sided flycatcher species assessment for the San Juan National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 20 pp.
- San Juan National Forest. 2004e. Northern leopard frog species assessment for the San Juan National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 22 pp.
- San Juan National Forest. 2004f. American marten species assessment for the San Juan National Forest. Unpublished Report, San Juan National Forest, Durango, CO. 20 pp.
- San Juan National Forest. 2004g. American marten species assessment, San Juan National Forest, management indicator species report. Unpublished Report, San Juan National Forest, Durango, CO. 19 pp.
- Schommer, T., and M. Woolever. 2001. A process for finding management solutions to the incompatibility between domestic and bighorn sheep. USDA Forest Service, Washington, DC. 62 pp.
- Schultz, C. 1999. 1998 boreal owl surveys, San Juan-Rio Grande National Forests, spring and autumn 1998. Unpublished Report, San Juan National Forest, Durango, CO. 14 pp.
- Sells, S. N., M. S. Mitchell, J. J. Nowak, P. M. Lukacs, N. J. Anderson, J. M. Ramsey, J. A. Gude, and P. R. Krausman. 2015. Modeling risk of pneumonia epizootics in bighorn sheep. *Journal of Wildlife Management* 79:195-210.
- Shannon, J. M., J. C. Whiting, R. T. Larsen, D. D. Olson, J. T. Flinders, T. S. Smith, and R. T. Bowyer. 2014. Population response of reintroduced bighorn sheep after observed commingling with domestic sheep. *European Journal of Wildlife Research* 60:737-748.
- Srikumaran, S. 2011. Letter to Wild Sheep Foundation regarding the development of a vaccine against pneumonia for use in bighorn sheep in the field. Unpublished Letter, Washington State University, Pullman, WA 99164. 1 pp.
- Subramaniam, R., S. Shanthalingam, J. Bavananthasivam, A. Kugadas, K. A. Potter, W. J. Foreyt, D. C. Hodgins, P. E. Shewen, G. M. Barrington, D. P. Knowles, and S. Srikumaran. 2011. A multivalent *Mannheimia-Bibersteinia* vaccine protects bighorn sheep against *Mannheimia haemolytica* challenge. *Clinical and Vaccine Immunology* 18:1689-1694.
- The Wildlife Society. 2015. The Wildlife Society & American Association of Wildlife Veterinarians joint issue statement, domestic sheep and goats disease transmission risk to wild sheep, approved March 8, 2015. Available on the internet at: http://wildlife.org/wp-content/uploads/2015/03/WS-DS_DiseaseTransmission_TWS-AAWV_JointStatement_APPROVED.pdf
- Towry, R.K. 1984. Wildlife habitat requirements. Pages 174-177 in Hoover, R.L., and D.L. Wills eds. *Managing forested stands for wildlife*. Colorado Division of Wildlife in cooperation with USDA Forest Service, Rocky Mountain Region Denver, CO.
- USAHA Joint Working Group. 2009. Recommendations on best management practices for domestic sheep grazing on public land ranges shared with bighorn sheep. United States Animal Health Association Joint Working Group, Committee of Wildlife Diseases &

Committee on Sheep and Goats, October 2009. Available on the internet at:

http://www.bighornsheep.org/article_USAHA%20Joint%20Working%20Group%20FINAL2_091109.pdf

USDA Forest Service 2015. Region 2 Regional Forester's Sensitive Species List, FSM R2 Supplement 2600-2015-1, August 14, 2015.

USDA Forest Service. 2013a. Risk Assessment and Viability Analysis for Rock Mountain Bighorn Sheep on the San Juan National Forest, August 21, 2013. 65 pp. Unpublished Report, on file at San Juan National Forest Supervisor's Office, 15 Burnett Court, Durango, CO 81301.

USDA Forest Service. 2013b. Bighorn sheep risk of contact tool users guide. USDA Forest Service, Intermountain Region, January 2013. Unpublished Document, prepared by USDA Forest Service Bighorn Sheep Working Group, and Critigen, Inc. 76 pp.

USDA Forest Service 2013c. Volume II: Final San Juan National Forest and proposed Tres Rios Field Office land and resource management plan. USDA Forest Service, San Juan National Forest, 15 Burnet Court, Durango, CO 81301. 328 pp. Available on line at <http://www.fs.usda.gov/goto/sanjuan/planning>.

USDA Forest Service. 2011a. USDA Forest Service, bighorn sheep analysis for NEPA documents, letter R-1, 2, 3, 4, 5 and 6. Joel D. Holtrop, Deputy Chief, Washington Office, Washington D.C. (August 19, 2011).

USDA Forest Service. 2010a. Record of Decision for the: Final Supplemental Environmental Impact Statement and forest plan amendment identifying suitable rangeland for domestic sheep and goat grazing to maintain habitat for viable bighorn sheep populations. Supplemented July 2010. Payette National Forest, 800 West Lakeside Ave, McCall, ID 83638. 38 pp. Available on the internet at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5238683.pdf

USDA Forest Service. 2010c. Appendix M, occupancy, risk, and the potential for contact report. Payette National Forest, 800 West Lakeside Ave, McCall, ID 83638. 13 pp. Available on the internet at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5238661.pdf

USDI Bureau of Land Management. 2000. BLM State Director's Sensitive Species List, CO-932, 6840, March 17, 2000.

USDI Bureau of Land Management. 1998. Instruction memorandum 98-140. Revised guidelines for management of domestic sheep and goats in native wild sheep habitats. USDI-BLM, Washington, DC. 6 pp.

USDI Fish and Wildlife Service. 2014. Endangered and threatened wildlife and plants; threatened status for the district population segment of the North American wolverine occurring in the contiguous United States; establishment of a nonessential experimental population of the North American wolverine in Colorado, Wyoming and New Mexico; proposed rule. Fed. Reg. 79:47522-47545.

USDI Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; threatened status for the district population segment of the North American wolverine occurring in the contiguous United States; establishment of a nonessential experimental population of the North American wolverine in Colorado, Wyoming and New Mexico; proposed rules. Fed. Reg.

- USDI Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; 90-day finding for a petition to list as endangered or threatened the contiguous United States population of the North American wolverine. Fed. Reg. 68:60112-60115.
- USDI Fish and Wildlife Service. 1998. Endangered species consultation handbook: procedures for conducting consultation and conference activities under section 7 of the endangered species act. U. S. Fish and Wildlife Service and National Marine Fisheries Service. March 1998, Final.
- USDI Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; 90-day finding for a petition to list as endangered or threatened the contiguous United States population of the North American wolverine. Fed. Reg. 60:19567-19568.
- Western Association of Fish and Wildlife Agencies. 2007. Recommendations for domestic sheep and goat management in wild sheep habitat. Wild Sheep Working Group, Initial Subcommittee, K. Hurley, Chair, June 21, 2007. Available on the internet at: <http://www.mwvcrc.org/bighorn/wafwawildsheepreport.pdf>.
- Wait, S. 2007. Personal Communication. Notes from phone conversation with Scott Wait on February 14, 2007. Regional Terrestrial Biologist, Colorado Division of Wildlife, Southwest Regional Office, Durango, CO.
- Wehausen, J. D., S. T. Kelley, and R.R. Ramey II. 2011. Domestic sheep, bighorn sheep, and respiratory disease: a review of experimental evidence. California Fish and Game 97:7-24.
- Weinmeister, B. 2012. Bighorn sheep management plan, data analysis unit RBS-20, Weminuche Herd. game management units S15 (Sheep Mountain), S16 (Cimarrona Peak), S28 (Vallecito). Colorado Parks and Wildlife. 67 pp. Available on the internet at: <http://cpw.state.co.us/Documents/Hunting/BigGame/DAU/BighornSheep/RBS20DAUPlan.pdf>
- Weinmeister, B. Personal communications with Brad Weinmeister, Terrestrial Biologist, Durango Area Office, Colorado Department of Parks and Wildlife, Durango, CO.
- Western Association of Fish and Wildlife Agencies. 2012. Recommendations for domestic sheep and goat management in wild sheep habitat. Wild Sheep Working Group. 24 pp. Available on the internet at: <http://www.wildsheepworkinggroup.com/resources/publications>.
- Wiggins, D. A. 2004. Black swift (*Cypseloides niger*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available on line at: <http://www.fs.fed.us/r2/projects/scp/assessments/blackswift.pdf>.

Figure 1. Weminuche Grazing Analysis Landscape.

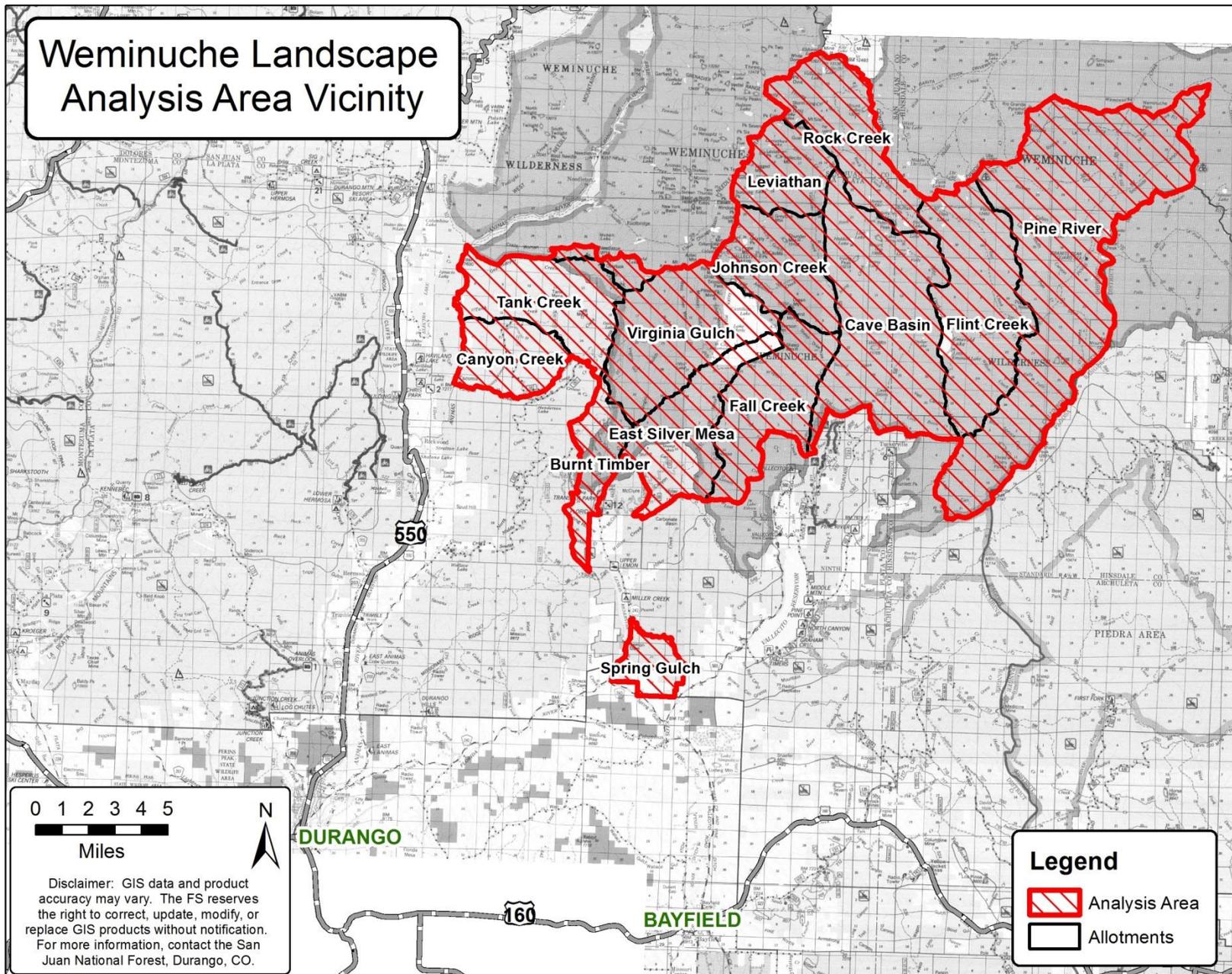


Figure 3. Alternative 2 (Current Condition) Overlap of Domestic Sheep Allotments with Bighorn Sheep Core Herd Home Range in the Weminuche Landscape.

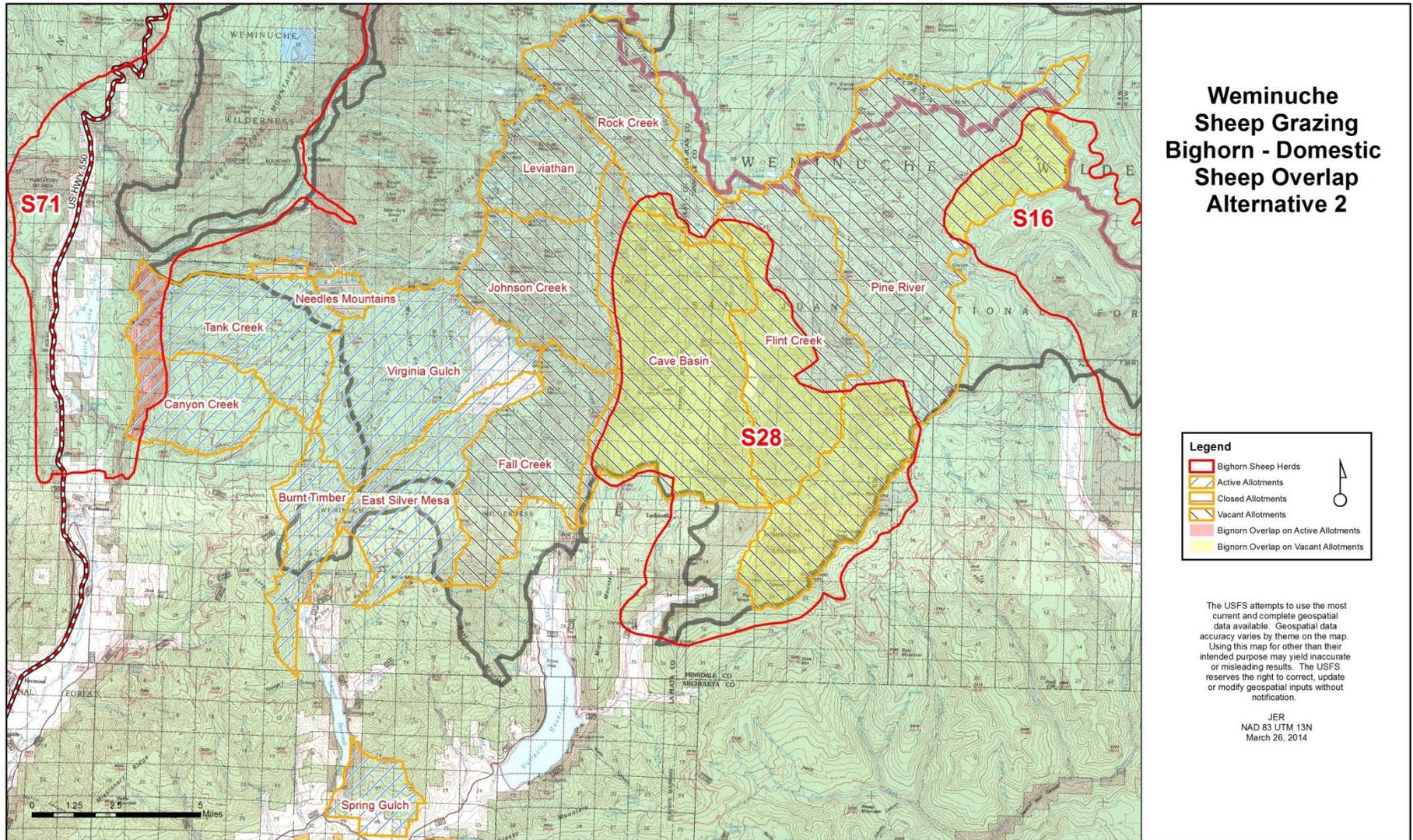


Figure 4. Alternative 3 (Forage Reserves) Configuration of Domestic Sheep Allotments and Bighorn Sheep Core Herd Home Ranges in the Weminuche Landscape.

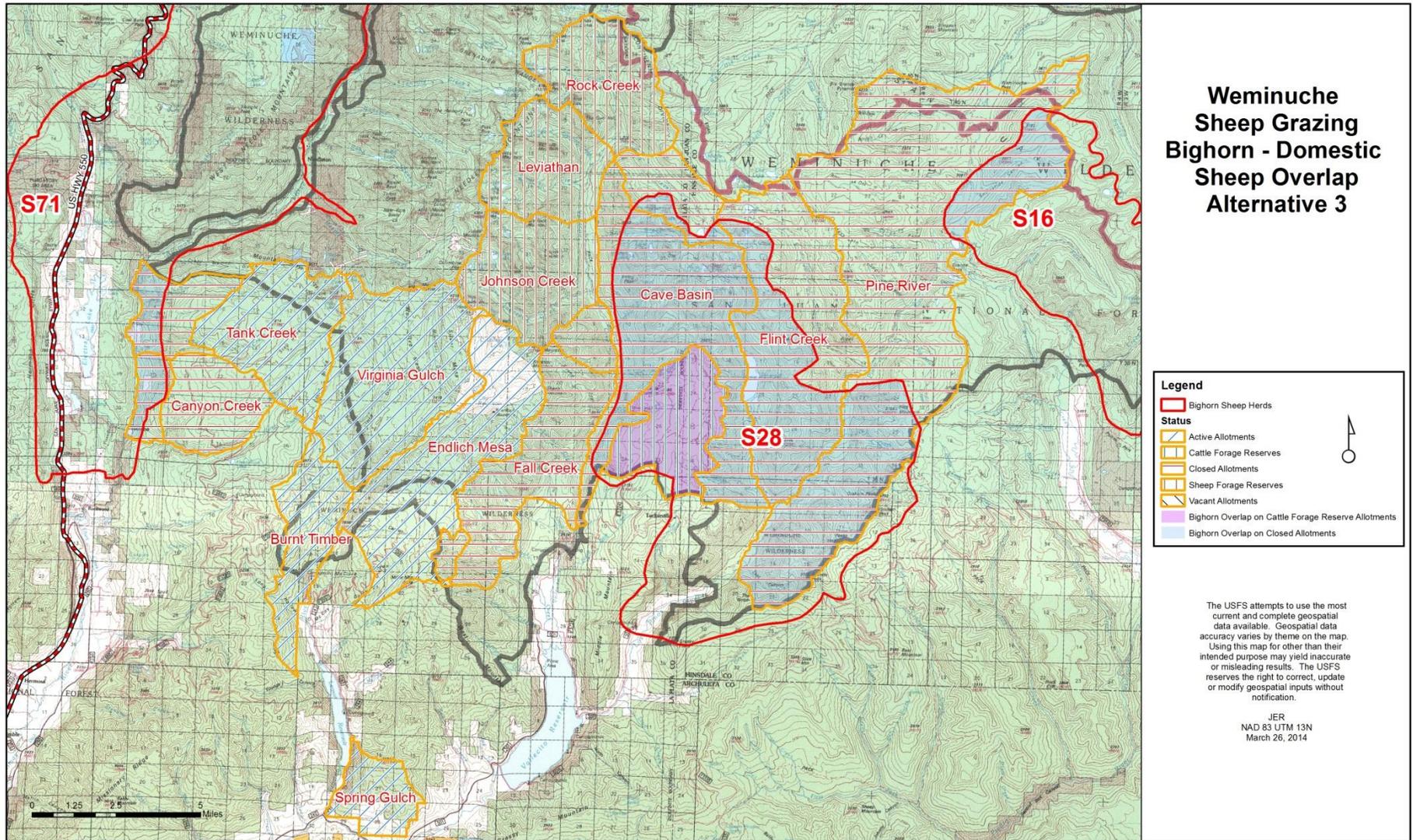


Figure 5. Alternative 4 (Preferred Alternative) Configuration of Domestic Sheep Allotments and Bighorn Sheep Core Herd Home Ranges in the Weminuche Landscape.

