CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for comparison of the alternatives presented in Chapter 2.

Effects are quantified where possible, and qualitative discussions are included. All significant or potentially significant effects, including direct, indirect, or cumulative effects are disclosed. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) include the following specific categories to use for the analysis of environmental consequences.

Direct and Indirect Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity.

Cumulative Effects

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over time (40 CFR 1508.7).

The cumulative effects analysis area for the Martin Basin Rangeland Project includes all public and private lands within the boundaries of the Santa Rosa Ranger District and all land included within the project area. This area is approximately 300,000 acres in size and includes the high elevation lands of the Santa Rosa Mountains. This area includes a wide range of habitats for various wildlife and fish species. Lands outside of this boundary are generally lower elevations, with the corresponding vegetative communities associated with those elevations. All past, present, and potential future management actions, projects, or other activities which may result in cumulative effects within the analysis area are listed in Appendix E. Within the effects discussion for each section, only those activities or actions that are likely to result in cumulative effects will be discussed.

Unavoidable Adverse Effects

Implementation of any alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. The interdisciplinary procedure used to identify specific range management practices was designed to eliminate or lessen significant adverse consequences. The application of Forest Plan standards and guidelines, project-specific design features, and

monitoring are intended to limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects would occur. The purpose of this chapter is to disclose those effects.

Short-term Use and Long-term Productivity

Short-term uses, and their effects, are those that occur annually or within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act and the National Forest Management Act (NFMA), all renewable resources are to be managed in such a way that they are available for future generations.

The grazing of rangeland vegetation can be considered a short-term use of a renewable resource. As a renewable resource, rangeland vegetation can be reestablished and grown again if the long-term productivity of the land is maintained. This balance between short-term use and long-term productivity is maintained through the application of the resource protection measures described in Chapter 2, Alternatives 1 and 2.

Irreversible and Irretrievable Commitments

Irreversible commitments describe a loss of future options. Irreversible applies primarily to the effects of use of nonrenewable resources such as mineral extraction or destruction of a cultural resource site. Once these resources are gone, they cannot be replaced. Irreversible can also apply to factors such as soil productivity that are renewable only over long periods of time.

Irretrievable commitments apply to the loss of production, harvest, or use of natural resources. Road construction activities are considered irretrievable commitments of resources.

Issue 1: WATER QUALITY

EXISTING CONDITION

Climate

Mean annual precipitation in the project area is approximately 15 to 40 inches (DRI 1997). However, rainfall may be less than normal in periods of drought. Most precipitation occurs as snow and/or rain during the winter and spring months. The driest time of the year tends to be during July and August. Because of snowmelt, the highest stream flows occur most often from March through June (USGS 2003).

Surface Water Features

The project area ranges in elevation from 5,000 to 9,700 feet and contains twenty-two subwatersheds that flow down either side of the north-south trending Santa Rosa Mountain Range. The west side of the project area flows into the Quinn River Watershed and east side of the project area flows into the Little Humboldt River Watershed. The Quinn River flows southwest from the National Forest boundary and terminates in the Black Rock Desert. The Little Humboldt River also flows southwest, but joins into the Humboldt River, which then terminates at the Humboldt Sink in the Humboldt Wildlife Management Area. Table 8 lists the subwatersheds, which are identified by their hydrologic unit code (HUC), and correlates them

with grazing allotment names. Major streams are also listed according to their respective subwatersheds.

There are two distinct landscapes within the project area. The southern half of the project area is characterized by steep terrain incised by canyons along both the east and west side of a backbone type mountain range. The north half is dominated by a broad basin with more gently sloping stream valleys.

The project area also contains a number of seeps and springs formed when groundwater flowed through geologic pathways, such as fractures or faults, onto the ground surface. There are at least 300 known seeps/springs in the project area. Many contribute flow to or are the source of streams. These seeps and springs are valuable water sources for wildlife and vegetation.

A number of the springs are also water sources for livestock water developments. Approximately 90 known water developments exist in the project area. Most are troughs fed by springs. Some are pit tanks dug into the ground that are also fed by springs and/or collect surface runoff. When installed at an appropriate location, water developments help to disperse livestock away from streams and riparian areas. However, many of the water developments and/or their associated fencing are in need of repair.

At least four streams that originate on the Forest have water diversions. These include Andorno Creek, Falls Canyon, Willow Creek, and Martin Creek. All except for the Andorno Creek diversion are located off National Forest System land. The off-Forest diversions are important to this analysis because of their cumulative effects (see Water Quality Cumulative Effects).

Table 8. Watersheds in the Martin Basin Rangeland Project Area.

WATERSHEDS	SUBWATERSHED HUC	MAJOR STREAM NAME	ALLOTMENT NAME
Quinn River	160402010802	East Fork Quinn River	Indian
	160402010803	South Fork Quinn River	
	160402010804	Jakes Creek	
	160402010702	Two Mile Creek	
	160402010706	Three Mile Creek	West Side Flat Creek
	160402010708	Canyon Creek	
	160402010403	Pole Creek	
	160402010404	Skull Creek	
	160402010408	Rebel Creek	Rebel Creek
	160402010305	Wood Canyon Creek	
		Rock Creek	
	160402010306	Antelope Creek	
		McConnell Creek	
		Dog Creek	
		Horse Canyon	Buffalo
		Falls Canyon	
		Pine Creek	
	160402010307	Buffalo Canyon	
		Austin Creek	
		Andorno Creek	
	160402011301	Peterman Creek	
		Chimney Creek	
		Porcupine Creek	
	160402010406	Willow Creek	Granite Peak
		South Fork Willow Creek	
		Gabica Fork	

WATERSHEDS	SUBWATERSHED HUC	MAJOR STREAM NAME	ALLOTMENT NAME
Little Humboldt River	160401090502	Indian Creek	
		South Fork Indian Creek	
	160401090303	Coleman Creek	
		Solid Silver Creek	
		Mullinix Creek	
	160401090302	Big Cottonwood Creek	
		South Fork Big Cottonwood Creek	
	160401091103	Long Canyon Creek	Martin Basin, Bradshaw, and Buttermilk
		North Fork Little Humboldt	
	160401090507	Martin Creek	
		Siard Creek	
		North Fork Cabin Creek	
		Cabin Creek	
		Bradshaw Creek	
	160401090506	Dutch John Creek	
		Lye Creek	
		Road Creek	
		Alkali Creek	
		Deep Creek	
		Harvey Creek	
		Round Corral Creek	
	160401090501	Buttermilk Creek	
	160401090506	Dry Creek	
		Spring City Creek	

Water Quantity

Soil compaction and ground cover removal caused by livestock grazing, especially in riparian areas, have the potential to increase runoff and sediment transport into streams by reducing the amount of infiltration and interception of precipitation and by capturing and channeling water. Instead of the precipitation being retained and slowly released by soil and vegetation, increased runoff creates peak stream flows with quicker response times and intensity. Less infiltration also decreases groundwater recharge and storage, resulting in lower base flows in streams and decreased groundwater supply to seeps/springs, wet meadows, and riparian areas. Baseflow and peak flow timing have also been altered by grazing related stream incision. As streams downcut, flood flows can no longer access the floodplain. This loss of recharge results in higher peak flow when water needs are low and lower baseflow when water needs are high. This decrease in water quantity will likely have a negative effect on aquatic life and the condition or type of vegetation in these areas.

Currently no gauging stations exist within project area watersheds for collecting long-term stream flow data to show the effects of grazing on water quantity. Using the riparian and wetland protocol for Properly Functioning Condition (Technical Reference 1737-15 1998), it is not likely that water quantity has been impacted in streams determined to be functioning. However, water quantity has likely been impacted in streams determined to be non-functioning or functioning-at-risk.

Water Quality

During the 2002 grazing season, water samples were collected from eight streams in the project area and analyzed for parameters typically affected by grazing activities. The water quality sampling was completed in association with other riparian assessment work which included

properly functioning condition (PFC). The Zone Hydrologist in cooperation with the interdisciplinary team (IDT) chose the sampling locations. The team identified streams where there were concerns about the streams morphological condition and the associated riparian vegetative communities where grazing management was assumed to have contributed at least in part to the over all condition. Twenty samples were analyzed in a laboratory for nitrate as nitrogen (Environmental Protection Agency (EPA) Method 300) and total phosphorous (EPA Method 365.3). Field water quality data were also collected at each sample location for temperature, turbidity, and dissolved oxygen. Although not likely affected by livestock grazing, pH was measured as an indicator of general water quality. Map 2 displays water quality sample locations.

The sampling strategy was not designed to provide a representative picture of the entire Martin Basin Rangeland Project area. Because all the streams that were sampled were known to have existing concerns, the results of the sampling should not be used to generalize the conditions of the entire project area. The water quality data from the 2002 grazing season are displayed in the Table 9.

Table 9. Water Quality Sampling Results.

SAMPLING LOCATION #	SURFACE WATER DRAINAGE	LABORATORY DATA		FIELD DATA			
		Nitrate (N) (mg/L)*	Phosphorous (P) Total (mg/L)	Temperature (°C)**	pH	Turbidity (NTU)***	Dissolved Oxygen (mg/L)
1	South Fork Quinn River	<0.5	0.14	10.6	8.0	0	10
2		<0.5	0.07	8.8	7.9	4	10
3		<0.5	0.06	9.1	8.2	1	8
4	Cabin Creek	<0.5	0.05	10.6	8.3	2.67	7
5		<0.5	<0.02	9.1	8.2	2.68	11
6		<0.5	<0.02	9.1	8.1	3.95	10
7	Three Mile Creek	<0.5	0.02	10.7	7.8	0	9
8		<0.5	0.02	10.7	7.9	0	9
9		<0.5	0.05	10.1	7.6	1	9
10	Canyon Creek	<0.5	0.06	10.2	8.4	2.07	7
11	Willow Creek	<0.5	0.03	15.7	8.6	1.56	10
12	Road Creek	<0.5	0.06	12.8	8.3	2.37	7
13		<0.5	0.03	9.9	8.2	4.66	6
14		<0.5	0.03	11.4	8.2	3.69	7
15	Siard Creek	<0.5	0.1	13.4	7.9	5.43	9
16		<0.5	0.11	13.7	7.7	4.3	8
17		<0.5	0.07	11.7	7.3	3.22	9
18	Martin Creek	<0.5	0.06	15.7	7.9	2.5	8
19		<0.5	0.04	15.4	7.7	1.49	7
20		<0.5	0.1	17.4	7.9	1.67	7

*mg/L = Milligrams/Liter
**°C = Degrees Celsius
***NTU= Nephelometric Turbidity Units

The state of Nevada has identified Martin Creek, North Fork of the Little Humboldt River, and South Fork Quinn River as Class A waters, which are held to the numerical standards in NAC

445A.124 as presented in Table 10. Class A waters include waters or portions of waters located in areas of little human habitation, no industrial development or intensive agriculture, and where the watershed is relatively undisturbed by man's activity. The beneficial uses of Class A waters are municipal or domestic supply, or both, with treatment by disinfection only, aquatic life, propagation of wildlife, irrigation, watering of livestock, recreation including contact with the water, and recreation not involving contact with the water.

Table 10. Water Quality Standards for Class A Waters.

ITEM	SPECIFICATION
Floating solids, sludge deposits, or taste or odor producing substances	None attributable to man's activities
Sewage, industrial wastes or other wastes	None
Toxic materials, oils, deleterious substances, colored or other wastes	None
Settleable solids	Only amounts attributable to man's activities which will not make the waters unsafe or unsuitable as a drinking water source or which will not be detrimental to aquatic life or for any other beneficial use established for this class
pH	6.5 to 9.0 Standard Units (SU)
Dissolved oxygen	≥6.0 mg/L
Temperature Maximum △T	 <20°C = 0°C
Fecal coliform (No.100ml)	≤200/400[a]
Total phosphorus (as P): In any stream at the point where it enters a reservoir or lake In any reservoir or lake In any stream or other flowing water	 ≤0.05 mg/L ≤0.025 mg/L ≤0.10 mg/L
Total dissolved solids	≤500 mg/L or one-third above that characteristic of natural conditions (whichever is less)

http://www.leg.state nv.us/NAC/NAC-445A.html#NAC445ASec121

In addition, the state of Nevada has established in NAC 445A.145 (the Tributary Rule) that waters without specified numerical standards that flow into a water with numerical standards must be held to the same numerical standards. Surface waters that dry up before reaching a water body with numerical standards, however, do not have numerical standards and must comply with the narrative standards in NAC 445A.121. The narrative standards consists mostly of statements requiring waters to be "free from" things such as, materials that change existing turbidity, high temperature, organisms pathogenic to human beings, and substances toxic to human, animal, plant, or aquatic life. This means that human activities, such as livestock grazing, are not allowed to alter the natural water quality as specified in NAC 445A.121. It does not mean that numerical water quality measurements cannot be used to gauge water quality for surface waters subject to NAC 445A.121. Even though numerical standards are not specified for a given water body, it is appropriate to use numerical measurements of water quality to determine if natural conditions

have been altered by human activities. For the surface waters listed in Table 8, Class A standards apply to all with the exception of Canyon Creek, Three Mile Creek, and Upper Willow Creek, which have narrative standards.

The state of Nevada recognizes in NAC 445A.120 that natural water quality conditions may on occasion be outside the limits established by the standards. This might occur, for example, under drought conditions. The "non-compliance," however, is only allowable if caused by nature. Human activities are not allowed to contribute to non-compliance.

Excessive nutrients may affect the trophic status of waters. Eutrophication results when sufficient quantities of nutrients are present to cause unwanted aquatic growth of vascular plants or algae. Nitrogen concentrations were less than 0.50 milligrams/liter (mg/L) for all samples. These values are below the acceptable limits of 0.89 mg/L and 1.32 mg/L for cold water and warm water fisheries respectively, as defined by the State. The total phosphorous concentrations were generally below the State numeric standard of ≤10 mg/L with a few exceptions. At sample location No. 1 on the South Fork Quinn River, total phosphorous was detected at 0.14 mg/L, which is slightly in excess of the 0.10 mg/L concentration allowable for Class A waters (Table 9). Siard Creek, a tributary to a Class A water, also had one sample (location No. 16) slightly above the standard at 0.11 mg/L (Table 9). These data suggest that nutrient levels are generally low in the surface waters of the project area. This is consistent with what Amache et al. (2004) found in the surface waters of central Nevada. They found that nutrient inputs were generally very low for surface waters on National Forest System lands, but increased substantially as they flowed through private land with fenced grazing areas and irrigated fields.

All of the sampled streams in the project area had numeric values that are below the State standards for temperature for Class A waters. Water temperature increase is primarily an impact to cold water fisheries and may occur both at the site of disturbance and downstream due to the additive effects of stream canopy removal through livestock grazing, harvest operations, wildfire, or debris flow. Physical alterations of stream channels within meadows through overgrazing have lead to wide shallow channels that intercept greater influxes of incident radiation than the narrow deep channels, which were once common throughout the meadowlands. Cold water fish, like trout, become stressed when stream temperatures rise above 22° C.

All of the streams sampled in the project area had levels that fell below the State numeric standards for Class A waters for dissolved oxygen. Dissolved oxygen is transferred to fish and other aquatic organisms as water moves past their gills. When concentrations drop below 5.0 mg/L, aquatic life becomes stressed. Oxygen can be present in the water, but at concentrations too low to sustain aquatic life. Oxygen is needed by virtually all algae and macrophytes (plants that dominate wetlands, shallow lakes and streams), and for many chemical reactions that are important to healthy stream and lake systems.

The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (phosophorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium, etc.). All of the sampled streams were below the State numeric standards for Class A waters for pH, with the exception of the slightly higher pH measurement on Willow Creek. While higher than Class A standards, the 8.57 pH reading for Willow Creek is actually within the EPAs national recommended water quality criteria for pH in freshwater (pH 6.5-9.0) (US EPA 2002). It is important to note that neither this EPA criteria nor the Class A standards legally apply to the non-class waters that are not tributaries to a Class A water. Because the non-class waters only have narrative standards (not numerical), the above comparisons to numerical standards and recommended criteria were only used to give a reference point for comparison.

Land management activities like grazing have been recognized as potential sources of non-point water pollution that comes in the sedimentation and turbidity. Best Management Practices (BMPs) can effectively eliminate or reduce the introduction of pollutants into receiving waters when applied before, during, or after pollution producing activities. Sections 208 and 319 of the Federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development. A complete list of grazing related BMPs are presented in Appendix G.

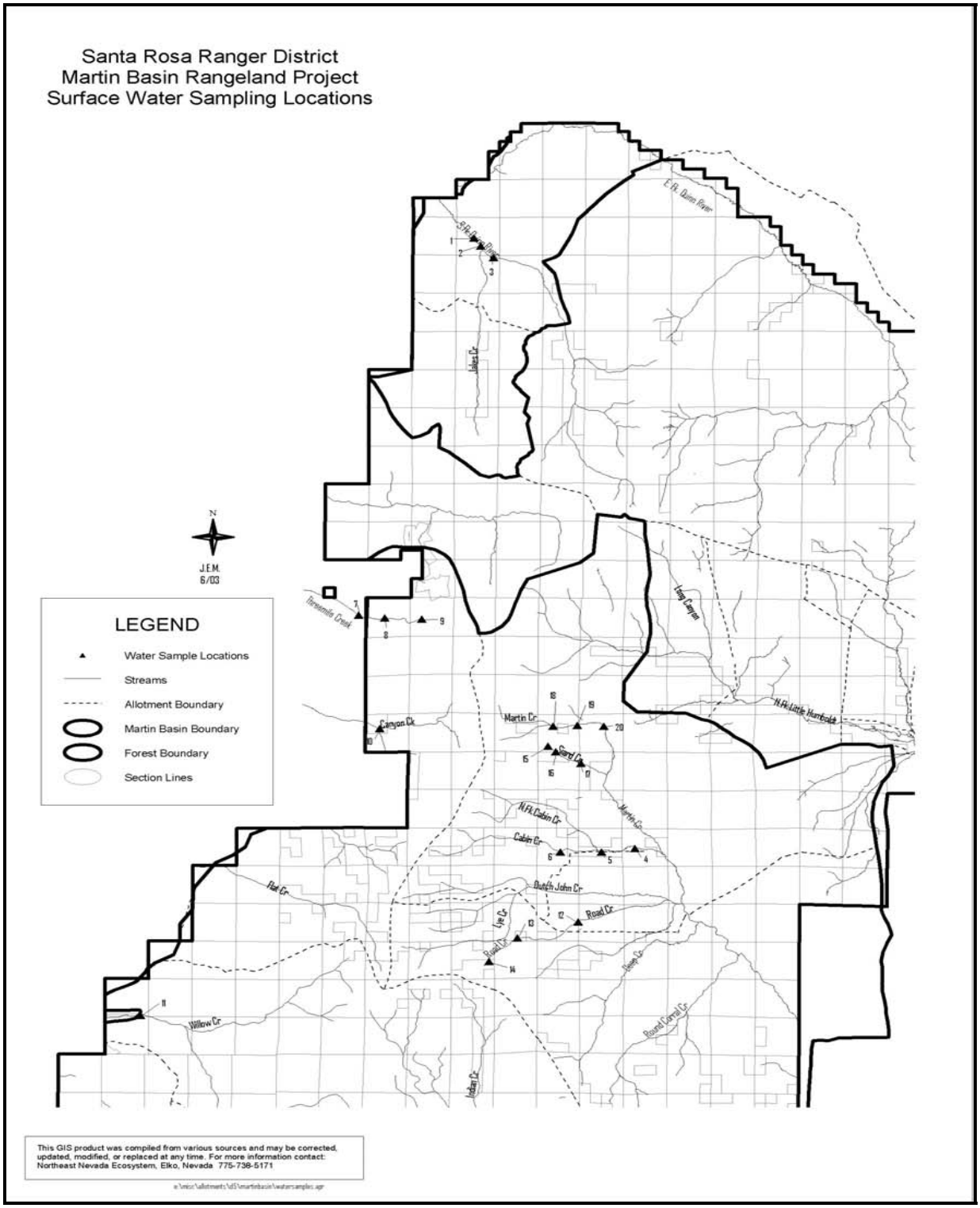
Turbidity and sediment levels in streams are important indicators of grazing impacts on water quality because they correlate to the degree of soil disturbance leading to soil erosion. As discussed below, turbidity is generally low in project area streams. The turbidity results alone may make it appear that sedimentation is not a problem in project area streams; however, measurements of sediment (<4 mm size class) in spawning gravels and the embeddedness of stream substrate materials by fines indicate just the opposite (Vegetation Specialist Report). Most areas were found to have in excess of 30 percent sediment, and substrate was 30 percent or more embedded (stream average).

Turbidity is dependant on stream velocity. During periods of high flow, turbidity values increase as the water column's ability to dislodge and transport substrate material increases. Turbidity is the measurement of suspended particles (e.g., silt, clay, and organic matter) while sediment data are generated by measuring the quantity of material that has settled onto the streambed. The turbidity data in Table 9 were taken during base (low) flow conditions. Class A waters have no numerical standards for turbidity. However, the EPA has identified 4.3 Nephelometric Turbidity Units (NTU) as a reference condition for turbidity in sub-ecoregion 13 surface waters, which includes the project area surface waters (US EPA 2000). The 4.3 NTU reference values do not represent an enforceable standard, but are useful as a means of comparison. With the exception of two turbidity readings slightly above 4.3 NTU, all other values were at or below the reference condition. This suggests that project area streams have an overall turbidity comparable to the reference condition.

Cattle waste products are known to introduce bacteria and other pathogens into water (Larsen et al. 1993). It is well established in the literature that fecal coliform and giardia can be introduced into water by cattle. Fecal coliform samples were not collected because of the difficulty of meeting laboratory hold times for samples collected in remote National Forest System lands. There is a limited amount of fecal coliform data from the Nevada Division of Environmental Protection (NDEP, Appendix C). Surface water samples were collected during the 2002 grazing season from one location each on Cabin Creek and the North Fork of the Little Humboldt River. The North Fork of the Little Humboldt River sample had a fecal coliform concentration of 31 per 100 mL, which is within the Nevada standards for Class A waters. In comparison, much higher results were obtained in two samples (one a duplicate) from Cabin Creek, which had fecal coliform concentrations of >2005 per 100 mL. While these high fecal coliform concentrations are cause for concern, it would not be prudent to make broad assumptions about fecal coliform concentrations in the project area based on this limited quantity of data.

Data suggests the water quality in the project area has some level of impairment for the following: water parameters, fecal coliform, sedimentation, and pH.

Map 2. Water Quality Sampling Locations.



ENVIRONMENTAL CONSEQUENCES

Effects Common to Alternatives 1 and 2

When livestock grazing is properly managed water quality in rivers and streams can be maintained at a level that is consistent with State water quality standards. Unmanaged or improperly managed livestock grazing has the potential to detrimentally affect water quality. This is because livestock grazing occurs over a large area of the landscape, and livestock tend to congregate in riparian areas and streams where water quality can be directly affected. According to published scientific literature reviews (Belsky et al. 1999, Branson et al. 1981, Buckhouse 2000, Krueger and Sanderson 2002, Meehan 1991), improperly managed livestock grazing can potentially have the following detrimental effects on water quality:

- Increased bacteria levels from livestock urine and fecal wastes;
- Increased turbidity/sedimentation due to soil disturbance and vegetation loss along streambanks;
- Higher water temperatures resulting from increased width to depth ratios and loss of shade-producing vegetation along streambanks;
- Lower dissolved oxygen levels resulting from increased aquatic plant growth (algae) and higher water temperatures (water solubility of oxygen decreases as temperature increases); and
- Increased nutrients, such as nitrates, from livestock urine and fecal wastes.

Elevated levels of bacteria can adversely affect the health of wildlife, livestock, and humans. Reduced dissolved oxygen availability, increased water temperatures, and sedimentation/turbidity levels are particularly harmful to the health of aquatic life. Increased nutrient levels cause unwanted growth of vascular plants and algae, reduce dissolved oxygen levels, impair visual quality, and impact beneficial uses. The scientific literature reviews listed above identified increased nutrients (nitrate and phosphate) from urine and fecal wastes as being a potential detrimental effect of livestock grazing. A recently published research study (Amacher et al. 2004) for the National Forest System lands of central Nevada, as well as data collected in the project area, suggest that elevated nutrient concentrations are not likely to occur in the project area unless livestock are heavily concentrated near surface waters.

Given these potential effects, water quality parameters for bacteria, sediment/turbidity, temperature, dissolved oxygen, and nutrients were used as indicators in the analysis of direct and indirect effects for each alternative. Table 11 summarizes the likely change to each indicator by alternative. The discussion presented in the paragraphs below analyzes the direct, indirect, and cumulative effects by alternative.

Table 11. Direct Effects Summary.

WATER QUALITY PARAMETER Duration of Effect	ALTERNATIVE 1 Current Management	ALTERNATIVE 2 Proposed Action	ALTERNATIVE 3 No Grazing/No Action
Bacteria (Fecal coliform)	Continues at historic levels or increases.	Levels decrease as numbers are reduced or vegetative buffer increases.	Levels decrease quickly once cattle are removed.
Duration*	On going.	On going at reduced levels.	Improvement begins immediately; continues until no attributable effect.
Sediment/ Turbidity	Continues at historic levels or increases.	Levels decrease as ecological condition improves and banks stabilize.	Levels decrease as ecological condition improves and banks stabilize. Occurs at a faster rate than the Proposed Action.
Duration	On going.	Improvement begins first year after implementation, takes years to decades. Improvement may become static at some improved condition.	Improvement begins immediately, recovery takes years to decades.
Water Temperature	Continues at historic levels or increases.	Levels decrease as ecological condition improves and riparian communities recolonize streambanks.	Levels decrease as ecological condition improves and riparian communities recolonize streambanks. Occurs at a faster rate than the Proposed Action.
Duration	On going.	Improvement begins first year after implementation, takes 1 to 5 years. Improvement may become static at some improved condition	Improvement begins immediately; recovery takes 1 to 5 years.
Dissolved Oxygen	Continues at historic levels or increases.	Levels improve as nutrient levels and water temperature decline.	Levels improve as nutrient levels and water temperature decline. Occurs at a faster rate than the Proposed Action.
Duration	On going.	Improvement begins first year after implementation. Decline may become static at some improved condition.	Improvement begins immediately; continues until no attributable effect, less than 1 year.

WATER QUALITY PARAMETER Duration of Effect	ALTERNATIVE 1 Current Management	ALTERNATIVE 2 Proposed Action	ALTERNATIVE 3 No Grazing/No Action
Nutrients, Nitrate and Phosphate	In areas of concentrated use continues at historic levels or increases.	In areas of concentrated use continues at decreased level as vegetative buffer improves and/or numbers are reduced.	Inputs from grazing no longer exist shortly after grazing ceases.
Duration	On going.	On going at reduced levels	Improvement begins immediately; continues until no attributable effect, weeks to months.

*Dependent on time it takes fecal matter to dissolve and the velocity of the stream. An average size bowel movement from a bear sitting on the edge of a stream takes approximately 16 hours to dissolve in a stream with velocity of 67 cubic feet per second (cfs) (Oasis Design 2008). Considering this information, it would take approximately 4 days to 3 weeks in a low flow stream (5 cfs or less).

ALTERNATIVE 1 – Current Management

Under Alternative 1, current allotment management plans would continue to guide management of the project area.

Direct and Indirect Effects

Water quality is directly affected when nutrients and bacteria are deposited or are transported into a water body.

Cattle grazing directly affects water quality through the loss of ground cover. Overgrazing, trailing and trampling remove ground cover. Areas void of vegetation channel water, which lead to rills and gullies. Ground cover intercepts raindrops. When soil is bare, raindrops compact the pour spaces at the soils surface decreasing infiltration rates, which increases overland flow. Vegetation works to slow water and trap sediment as it travels over the landscape. When ground cover is sparse or absent, sheet erosion carries sediment to stream channels.

Cattle grazing directly affects water quality by destabilizing streambanks. Increased turbidity and sedimentation occur when vertical banks widen and erode. Streambanks are often unstable at stream crossings where cattle traffic is concentrated.

Overgrazing and trampling directly affect water quality when conversions in vegetation types occur. Riparian vegetation has deep, dense roots that are very efficient at holding soils in place. When riparian communities are over grazed, they often under go conversion to communities that are unable to withstand the increased stress during high flow, and streambanks easily erode.

Water quality as it relates to temperature is indirectly affected by cattle grazing. Overgrazing can lead to a loss of riparian vegetation, which provides thermal regulation during the summer months when solar radiation is high. Water temperatures are higher in stream channels affected by grazing where width-to-depth ratios are high and water surface area is increased.

Cattle grazing indirectly impacts water quality as it relates to dissolved oxygen when stream temperatures and nutrient loads are elevated because of grazing activity.

With a few exceptions, water quality in the streams sampled was generally found to fall below the numerical water quality standards set by the state of Nevada (see Affected Environment). However, many project area streams do not comply with narrative anti-degradation standards

(rules) in the Nevada Administrative Code (NAC 445A) and the Clean Water Act, as amended. Of primary concern is excess sediment accumulation. Livestock grazing contributes to increased erosion and sedimentation problems within the project area.

As discussed in the Vegetation section, many of the drainages in the project area are functioning-at risk. Northeast Cabin, the lower end of Three Mile and the South Fork of Quinn Creeks are all rated as non-functioning. Livestock-caused disturbance has exposed soil to erosion and riparian areas have reduced ability to trap sediment before transporting it into the channels by overland flow. Many of the drainages within the project area have high width-to-depth ratios that can mostly be attributed to livestock-caused streambank alteration. High width-to-depth ratio indicates streams are impaired as it relates to their ability to transport sediment once it enters the stream channel. Field observations indicate there is increased sedimentation from unstable banks. Drainages that are being degraded by livestock grazing are at risk of degrading to a point where their water quality does not meet State water quality (both numerical and narrative), and Forest Plan standards.

Under this alternative, the water quality conditions would remain unchanged, recover at their current rate, or degrade further if allotments are improperly managed or occurrences of trespass remain unchanged. Riparian areas and streams that are currently recovering from overgrazing would likely recover at a slower rate than with the other alternatives due to the reoccurring impacts of the current utilization levels. Areas that are not functioning as desired or are functioning-at-risk would continue to have elevated erosion rates and would be prone to extensive erosion during flood events (e.g., down cutting of channels) (Rosgen 1996). Resource degradation in areas that are currently unimpaired may occur if those areas experience mismanagement or overgrazing by trespass cattle. Given the effects described above, Alternative 1 would likely show the least progress towards achieving desired conditions.

Cumulative Effects

Livestock have been grazing in the project area for over a century. Cumulatively, livestock grazing has and continues to be the single greatest landscape activity within the area. Grazing is the largest management activity contributing to detrimental effects on water quality and quantity. The causes and effects of how grazing impacts these water issues are explained in detail in the Hydrology Report (project record).

Livestock developments include fences, water developments (both troughs and ponds) and other structures that have been developed to improve the management of livestock and have positive effects on water quality. Development of off-site watering reduces pressure and stress on streams and springs and their associated vegetation. Many of these developments were first constructed during the early 1900s. Reconstruction of these water developments and fences occur over time. Some of these developments are occasionally relocated to improve or protect resources. Currently the following projects are in the planning phases or being developed and would involve the construction of new fences or water developments. The Cabin Creek Watershed Project on the Martin Basin and Bradshaw Allotments will involve the reconstruction of approximately 3 miles of fence, the construction and/or relocation of approximately 8 miles of fence, and the ultimate removal of approximately 9.5 miles of fence. At the completion of the project, there will be a reduction of approximately 1.5 miles of fence. Additional water developments and fences may be required on allotments within the cumulative effects area to ensure appropriate management of livestock. The current needs or locations of additional developments are not known at this time.

Reasonably foreseeable future activities/events that may act cumulatively with grazing to affect water quality and quantity include weather events (e.g., drought), wildfires, mining, roads, and increased recreation.

In 2001, a wildfire started in the main stem of the Willow Creek drainage and burned across the ridgeline of the Santa Rosa Range, affecting the North Fork of Cabin Creek, South Fork of Canyon Creek, Flat Creek, South Fork of Flat Creek, Three Mile Creek, Gavica Fork of Willow Creek, and Pole Creek (Jenne 2002). Approximately 41,828 acres were burned (25,270 acres on National Forest System lands). Fire history records indicate 100,000 acres of the project area have been impacted by fire over the past several decades; 12,900 acres have burned since 2001. Areas that have been most affected by large scale catastrophic wildfires include the western and northern portions of the project area within the Buffalo, Granite Peak, Indian, Rebel Creek and West Side Flat Creek Allotments. Wildfires cumulatively affect water quality, from accelerated erosion rates, increased sedimentation and turbidity, release or loss of nutrients from burned vegetation, loss of hydrologic function from changes in soil structure, increased water temperatures due to decreased shade, and decreased bank stability from loss of vegetation (National Wildfire Coordinating Group [NWCG] 2001). The duration of the effect is dependent on intensity and recovers over time in 2-10 years.

Under the Buttermilk Prescribed Burn Decision an additional 2,400 acres could be treated with prescribed fire and 400 acres may be treated mechanically methods within unit 5 in the Martin Basin Allotment. This project was evaluated as part of the existing condition.

Cumulative impacts to water quality has also resulted from the acid mine drainage that enters the headwaters of the North Fork of the Little Humboldt River (a Class A water) from the historic Buckskin Mine. A water pollution report was completed in 2002 (Brooks 2002) and a summary of the results can be referenced in the hydrologist specialist report. An adit on the mine site currently discharges as much as 53 gallons per minute of pH 2.2 to 3.0 water into the river. These pH levels are outside Nevada's acceptable range (pH 6.5 to 8.5) for Class A waters. Currently a project is in the final planning phases to abate the water quality issues on the site using an infiltration gallery which will prevent the contaminated water from entering the stream. As discussed in the Affected Environment, grazing has little to no measurable impact on pH. The impacts of acid mine drainage are only discussed to disclose a comprehensive discussion of the overall water quality. Until the effects of this prior management activity are mitigated, the standard in the Matrices for pH would continue to be exceeded unrelated to the impacts of grazing. Since the pH of water determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals, pH level affects the rate at which other water quality parameters improve.

In 2006, a mineral exploration company near the Buckskin Mine accidentally released approximately 7 cubic yards of drillers mud (clay) into the headwaters of the North Fork of the Little Humboldt River. Completion of a successful clean-up effort under the direction of the Nevada Department of Environmental Protection, in cooperation with the Forest Service and the Nevada Department of Wildlife, is expected in the near future. The duration of the cumulative effect is expected to end when clean up is complete.

Historically, roads on the Santa Rosa Ranger District developed as a result of mining activities, recreation, hunting, livestock management, fire suppression activities, and for land management. In more recent years, recreational use has increased including the use of off highway vehicles (OHVs). Although use has increased, it has generally been considered light compared to other Forest Service Districts. The Santa Rosa Ranger District has approximately 327 miles of open roads and motorized trails. There are approximately 3 acres of road per mile. This equates to less than one percent of the project area. Dispersed camping areas located throughout the District are often located near streams and other riparian areas. Roads, trails, and campsites are generally devoid of vegetation so would cumulatively add to the amount of bare ground in the project area. Dispersed campsites also present some risk for the potential release of hazardous substances or human waste into waterways which can impact water quality. Road densities are approximately

0.70 miles per square mile which is considered low. Recreational use is also light in the area. Therefore the potential adverse effects of these activities is considered limited even when combined with the impacts from grazing. The duration of the effect is on going and not expected to decrease over time.

On December 13, 2007, the Santa Rosa Travel Management Project decision was signed. Under this project a system of motorized roads and trails was designated and off road travel was restricted. The designated system of roads and trails includes 310 miles of road and 17 miles of motorized trails. The only foreseeable road construction within the cumulative effects area would be temporary roads associated with mineral exploration activities. There are no additional plans for the construction of any roads or motorized trails at this time. Restriction of off road travel will improve water quality and soil productivity by reducing bare ground, compaction, and erosion.

Restoration has resulted in cumulative effects that have been beneficial to water quality. Between 1990 and 2005, a number of watershed improvement projects were successfully implemented to correct watershed problems including streambank stability, headcut rehabilitation, meadow and spring restoration, and other riparian restoration projects. During the mid 1990s a large riparian pasture was created on the East Fork of the Quinn River on the Quinn River Allotment. Treatments were also completed to stabilize streambanks and encourage willow reproduction. Management changes were implemented and have resulted in significant improvements in riparian condition on approximately 6 miles along the East Fork of the Quinn River.

In 2003, three large headcuts were reshaped, stabilized, and revegetated on the East Fork of the Quinn River on the Quinn River Allotment. Today these areas are fully stabilized, vegetated, and the sites are no longer barriers to fish migration. The District also reshaped, stabilized, and revegetated a large headcut on a spring and intermittent channel within the Abel Seeding on the Paradise Allotment. Today the area is enclosed within a five plus acre exclosure and is fully stabilized and vegetated.

In 2004, the District implemented the Camus Watershed Project which reconstructed a deeply incised intermittent channel in the headwaters of Tom Basin on the Buttermilk Allotment. The area was then seeded and a 100-acre exclosure installed to protect the site. During 2005, floodwaters damaged the treatments and the District repaired the channel and planted willows throughout the site. During the 2006 season the site was fully vegetated and stabilized with new willows growing and live water flowing within the new channel. Site visits during 2008 confirmed that the site continues to improve and riparian vegetation is well established on the site. During 2004, the District worked with the Nevada Department of Environmental Protection to reconstruct the Round Corral Riparian Exclosure, which protects 20 acres adjacent to the Round Corral Creek within the Buttermilk Pasture of the Buttermilk Allotment.

In 2005, the District reconstructed the Buttermilk Meadows Exclosure on the Buttermilk Allotment. This exclosure protects a large meadow system that is approximately 150 acres. Recovery on the meadows was limited prior to 2005 due to serious grazing non-compliance issues. Reconstruction of the exclosure has resulted in some improvement in conditions. This area is currently two years into a four-year rest from livestock grazing.

In 2007, the District approved a project to extend the Quinn River riparian exclosure. The project will extend the existing Quinn River riparian pasture and protect an additional 1.5 miles of the East Fork of the Quinn River on the Quinn River Allotment. This project is expected to be implemented during the summer of 2009.

The District is also in the planning stages for the Cabin Creek Riparian Pasture Project. This pasture will relocate existing fences and pasture boundaries to improve livestock management

within portions of Cabin Creek, Martin Creek, Bradshaw Creek, Road Canyon Creek, and Dutch John Creek. The project will improve livestock management to meet riparian objectives on these streams and ensure upward trends in riparian conditions by improving the distribution of livestock and reducing the concentration of livestock along streams and riparian areas. This project will involve approximately 4,500 acres within the Martin Basin and Bradshaw Allotments. A decision is expected sometime during the winter of 2009 with implementation beginning in the late spring of 2009.

The District is beginning the planning on the Bullion Springs Watershed Project. This project will involve the complete reconstruction and restoration of approximately 1.4 miles of Buttermilk Creek, which is located within the Spring City Pasture of the Buttermilk Allotment. The stream has downcut as much as 20 feet and lacks riparian vegetation. This project will restore the stream channel and reestablish riparian vegetation similar to the Camus Watershed Project described above.

In the future, it is expected that at least, one watershed improvement project will be completed each year on the Santa Rosa Ranger District. These projects are expected to focus on riparian area and stream restoration and stabilization and/or closure and rehabilitation of unauthorized roads.

Alternative 1 presents the greatest cumulative effects to water quality and stream/riparian conditions particularly related to sedimentation within streams.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

The direct effects of nutrients and bacteria are expected to decrease under Alternative 2 as livestock numbers are reduced or increases in residual ground cover from lower utilization levels lead to increased vegetative buffers. The effect is expected to continue at reduced levels.

Streambank stability and ground cover retention is expected to improve as the ecological condition improves. Lower utilization rates and adjustments to utilization resulting from monitoring are expected to promote the growth and maintenance of riparian species. Improvement is predicted to begin the first year after implementation and takes years to decades for bank recovery and 1-5 years for a measurable recovery of the vegetation. Improvement may become static at some improved condition.

Under Alternative 2, temperature levels decrease as ecological condition improves and riparian communities recolonize streambanks providing shade. Over time width-to-depth ratios are expected to decrease as stream channels narrow. Improvement is expected to begin the first year after implementation and would take 1-5 years to show substantial change for vegetation and years to decades for changes in width-to-depth ratios. Improvement may become static at some improved condition

Under Alternative 2, dissolved oxygen levels are expected to improve as nutrient levels and water temperature decline. Improvement should begin the first year after implementation. Decline may become static at some improved condition.

Under Alternative 2, water quality conditions would likely improve with time. Improved grazing management would lead to an improved ecological condition and more residual ground cover. These improvements in ground cover type and amount create vegetative buffers that filter unwanted livestock urine and fecal material resulting in reduced inputs of bacteria and nutrients and improved water quality. Improved grazing management would also mean less soil disturbance and vegetation loss, resulting in increased streambank stability, decreased

sedimentation in streams, and lower water temperatures due to the growth of shade providing vegetation along streams. More vegetation cover would slow storm run-off and improve infiltration rates improving stream base flows and decreasing the timing and intensity of peak stream flows that have the potential to cause catastrophic flood damage. For areas that are currently moving towards desired condition, the recovery rate is likely to become more rapid due to decreased stress from grazing. Adjustments to grazing based on the monitoring program under this alternative would promote improvements in the ecological condition and maintain the system at or move it toward desired condition.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. Because livestock grazing in the project area has the potential to have a greater impact as compared to other management activities that affect stream/riparian conditions, the changes in grazing management under Alternative 2 would likely result in an overall decrease in detrimental cumulative effects on the Forest. Better watershed conditions would result in better quality of water leaving the project area for downstream beneficial uses.

ALTERNATIVE 3 – No Grazing/No Action

Alternative 3 would eliminate grazing on all allotments within the Martin Basin Rangeland Project area.

Direct and Indirect Effects

Under Alternative 3, the direct effects of nutrients and bacteria are expected to decline quickly once livestock numbers are removed. Improvement begins immediately and continues until there is no effect related to grazing.

Streambank stability and ground cover retention is expected to improve as the ecological condition improves. Recovery would occur at a faster rate than Alternative 2. Improvement is predicted to begin immediately; recovery takes years to decades for streambanks and 1-5 years for a measurable recovery of the vegetation.

Under Alternative 3, temperature levels decrease as ecological condition improves and riparian communities recolonize streambanks providing shade. Over time, width-to-depth ratios are expected to decrease as stream channels narrow. Improvements occur at a faster rate than with Alternative 2. Improvement is expected to begin the first year after implementation and take 1-5 years to show substantial change for vegetation and years to decades for changes in width-to-depth ratios. Improvement may become static at some improved condition.

Under Alternative 2, dissolved oxygen levels are expected to improve as nutrient levels and water temperature decline. Improvement begins at permit termination and continues until there is no effect. Recovery is expected in less than one month.

Alternative 3 is likely to have the most beneficial effect on water quality over the long term. Once livestock grazing is discontinued in the project area, there would be no new adverse effects caused by grazing. For example, there would no longer be any livestock urine and fecal matter to contribute nutrients and bacteria to streams, and sedimentation in streams would be reduced as streambanks stabilized and riparian vegetation recovered. With no stress from livestock grazing, it is also likely that stream/riparian areas on the Forest would move towards desired condition at a faster rate than the other alternatives. However, the rate at which an area moved towards desired condition would depend on its current condition, physical process, and cumulative effects.

There may be a detrimental effect to private or other public lands under Alternative 3. If cattle do not have access to the Forest for grazing, the grazing intensity on these off-Forest lands may

increase as more cattle are shifted to other public and private lands. This could lead to even greater damage to the off-Forest water resources and riparian areas.

Cumulative Effects

As discussed earlier in Alternative 1 cumulative effects, livestock grazing is the single greatest landscape activity in the cumulative effects area. It likely has the greatest and most widespread effect on water resources and riparian area conditions. If livestock grazing was no longer a permitted activity, then the cumulative impact to water resources and riparian areas would likely decrease with time. As with Alternative 2, better watershed conditions are expected under Alternative 3. This would likely result in improved quality of water leaving the Forest for downstream beneficial uses. As mentioned above, there may be adverse cumulative effects on private and Bureau of Land Management (BLM) administered lands as a result of this alternative. This alternative may result in changes in land uses and practices on adjacent lands which may adversely affect water quality within the lower reaches of the watersheds.

Issue 2: SOILS

EXISTING CONDITION

In this section, a description of existing soil conditions in the project area provides the basis for assessing the projected environmental effects of the alternatives that follow.

Geology and Physiography

The Martin Basin Rangeland Project Area lies within the Santa Rosa Mountain Range and the Owyhee Desert Volcanic Plateau. The Santa Rosa Range contains Humboldt County's highest point (Granite Peak at 9,732 feet) and nearly 30 miles of the main ridge stand above 8,000 feet, forming imposingly steep slopes as viewed from adjacent valleys (Willden 1964). The higher parts of the range are glaciated to levels as low as 7,500 feet. Most of the Santa Rosa Range is underlain by a very thick sequence of Upper Triassic to Jurassic shales and sandstones that were tightly folded and metamorphosed to phyllites and quartzites prior to late Cretaceous or possibly early Tertiary period. A number of granitic stocks then intruded these formations. All of these basement rocks deeply eroded by middle Tertiary time were intruded and covered by volcanic rocks consisting of andesites, basalts, dacites, and rhyolites. Later erosion removed the volcanic rocks from almost all of the main Santa Rosa Ridge, but the volcanic sequence exposed locally near the base of the range closes completely over the granitic and metamorphic rocks north of Buckskin Mountain (Willden 1964).

The Owyhee Desert Volcanic Plateau lies to the east of the Santa Rosa Range. The area is characterized by moderate to low relief except on the south border and near the deeply incised channels of Martin Creek and, to a much lesser extent, the North Fork of the Little Humboldt River and the East Fork of the Quinn River. Rocks of mostly volcanic and sedimentary origin underlie the area (Willden 1964).

Soil Characteristics

Information on basic soil types in conjunction with potential natural vegetation communities was first published in 1986 and updated in 1991 (USDA Forest Service 1991b). Baseline soil data were collected by reconnaissance-level surveys completed for the eastern part of Humboldt County by the National Cooperative Soil Survey in 1991-1992 (USDA Natural Resource

Conservation Service 2002)[6]. Over half of the soils in the project area have a surface texture of gravelly to bouldery loam. The remainder is mostly loam and silt loam. Approximately 4 percent of the project area is comprised of barren rock outcrop and rubble land.

Based on soil survey data, predictions may be made for areas most sensitive to adverse soil impacts (Table 12). Many of these acreages overlap and an area may be susceptible to more than one type of potential adverse soil impact.

Table 12. Soil Susceptible to Detrimental Effects (acres).

RATING	COMPACTION (acres)	WATER EROSION (acres)	WIND EROSION (acres)
High	2,081 (1.08%)	84,978 (44.43%)	4,351 (2.27%)
Moderate	133,631 (69.87%)	61,352 (32.08%)	109,411 (57.21%)
Low	46,572 (24.35%)	35,954 (18.79%)	68,522 (35.82%)
Other Acres (rock outcrop/rubble)	8,965 (4.70%)		
Total Project Area (acres)	191,249		

Human Influences on Soil Condition

The history of use of the rangeland in the project area is similar to other comparable regions throughout the West: early settlement, rapid development of the livestock industry, and influx of many nomadic grazing herds. These nomadic herds, lacking a base of operations, stayed on the ranges as long as weather permitted. This use coupled with the grazing herds of the local ranchers and settlers, together with game herds increasing under protection by law, modified much of the rangeland from its original condition prior to the establishment of the Santa Rosa Ranger District in 1911 (Robertson 1971).

Excessive grazing, by livestock prior to the founding of the Humboldt National Forest, caused soil compaction, loss of effective ground cover, head cutting, post holing, and puddling. Some impacts occurred from elk but most were due to the concentrated herds of cattle, horses, and sheep. More recently, fenced grazing has altered natural disturbance patterns and created different vegetative spatial and temporal patterns than existed before European settlement. This level and duration of grazing likely had an adverse effect upon the soil resources. Generally, greater declines in soil quality and productivity are associated with greater intensities of grazing, roads, recreational use, mining, and fire (Reid 1993). Soil forming and soil recovery processes can be slow; therefore, disruption of soils can lead to long-term changes in ecological conditions, including biological and hydrologic processes. Areas with thick fertile topsoil are most likely to recover after a disturbance. In areas where much of the topsoil is lost, the site may no longer be able to support historic vegetation (USDA Natural Resources Conservation Service 2001). Indicators of soil quality that may affect short and long-term soil productivity include compaction, erosion, and percent ground cover.

[6] A soils map based on the Soil Survey of Humboldt County showing the dominant soil series type for each soil association mapping unit in the project area has been included in the project record.

Current Soil Conditions

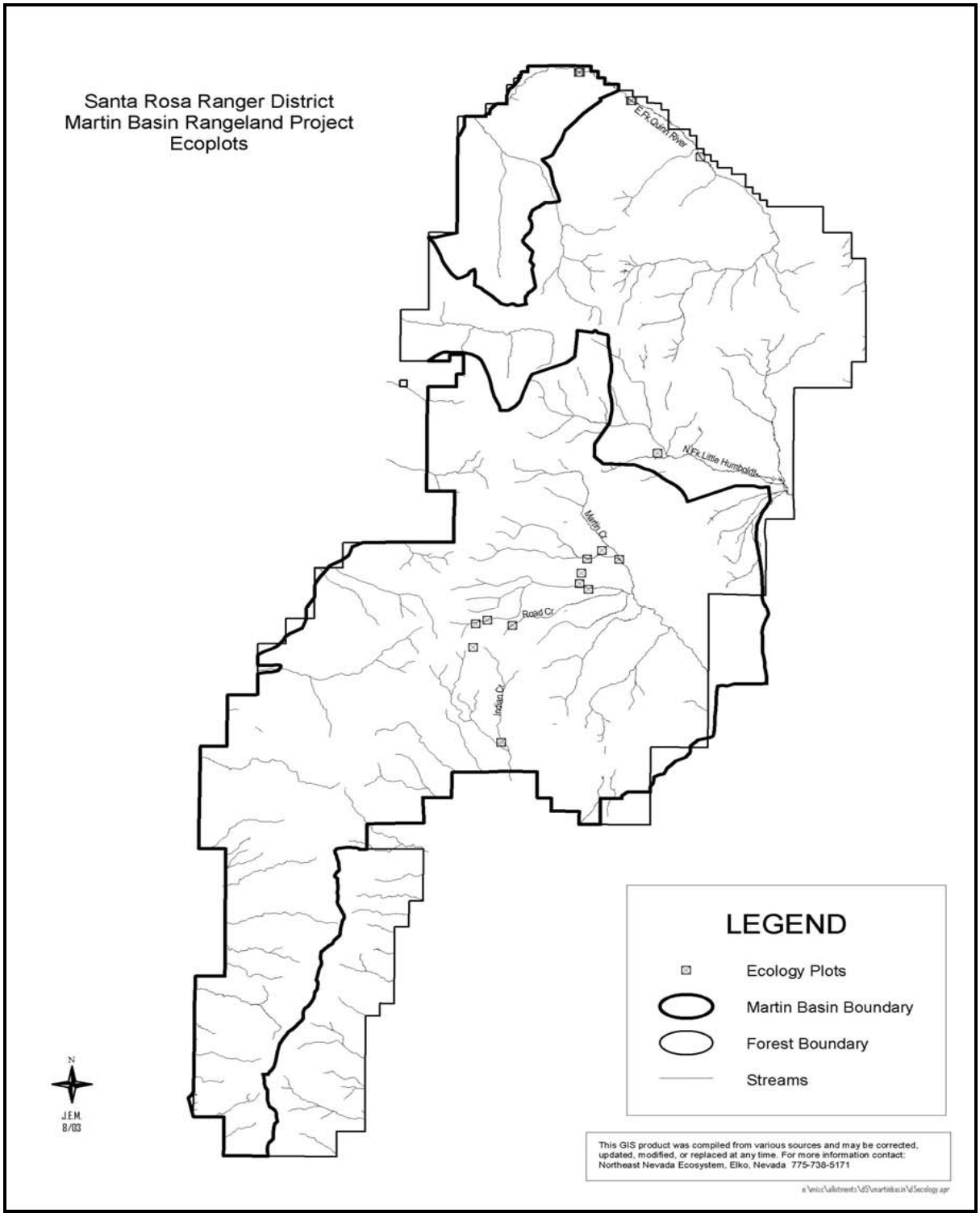
Forest personnel conducted site-specific soil and vegetation surveys (Map 3) to gather more detailed baseline data on ecological conditions from 1995-2002. The plots occur mostly on the wet meadow and dry-to-moist meadow vegetative groups.

Quantitative and qualitative factors for soil condition, along with parameters for vegetation, hydrology, and disturbance have been combined into matrices for eight representative vegetative groups that occur in the project area. The categories of vegetative groups are wet meadow, stream, dry-to-moist meadow, cottonwood, Wyoming big sagebrush, mountain big sagebrush, aspen, and mountain brush. These eight groups are simplified from the range site descriptions for potential vegetation communities present in the project area (USDA Forest Service 1991b) and from the site-specific soil and vegetation sampling conducted by Forest personnel from 1995-2002.

With the *Humboldt-Toiyabe National Forest's Vegetative Condition Matrices* (the Matrices), a vegetative group may be quickly evaluated to see if it is functioning, functioning-at-risk, or non-functioning. Functioning describes what a vegetative group should look like as management direction is implemented. Functioning-at-risk indicates that the site has management problems that may be corrected to bring the site back to a "functioning" condition. Non-functioning indicates that the site has crossed an ecological threshold and is not easily restorable to a "functioning" ecological condition.

Inputting the soil parameters to the Matrices to the 22 ecology plots (Map 3) suggests that soil health is impaired for at least one parameter on every site except one. On approximately one-third of the sites, none of the soil criteria appears to be functioning as desired. Soil parameters at the remaining sites suggest that they are functioning-at-risk.

Map 3. Ecoplot Locations.



It is likely that historic and current grazing practices, along with areas of known livestock concentrations (Table 13), combined with the effects of drought have contributed to impaired soil health.

Table 13. Soil Disturbance Acres for Areas of Known Concentrated Livestock Use.

ALLOTMENT	CONCENTRATED USE DISTURBANCE* (acres)	PERCENT OF PROJECT AREA
Buttermilk	506	0.26
Bradshaw	91	0.05
Granite Peak	444	0.23
Indian Creek	118	0.06
Martin Basin	720	0.38
Rebel Creek	16	0.01
West Side Flat Creek	523	0.27
Streams "Perennial and Ephemeral" within the Project Area	2,409	1.26
Springs/Seeps within the Project Area	1,050	0.55
Total Affected Acres	5,877	3.07

*Fences and Water Developments

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

The effects common to all alternatives include a general susceptibility of soil loss due to past and present grazing use. The magnitude of the potential loss varies between alternatives. The allotments with a greater grazing intensity or with higher proportions of easily eroded soils have a greater potential for direct and indirect effects. The cumulative effects are also similar for each alternative, much like the direct and indirect effects. The magnitude of cumulative effects also varies by alternative. Management practices, constraints, and design features for soil, water, and riparian improvement should be considered under all action alternatives. All of the alternatives affect the potential for riparian vegetation establishment and, thereby, have at least some impact on the soil resource in the short (0-15 years) or long term (15+ years) or both. It is expected that the effects for the soil resource, as described for each alternative, would be similar for all allotments.

Effects Common to Alternatives 1 and 2

The following effects to the soil resource from livestock grazing are universal across the landscape.

Direct effects to the soil resource include physical impacts such as compaction (a decrease in soil bulk density caused by livestock hooves reducing surface soil porosity). This causes reductions in water infiltration, percolation, and air exchange in the soil. There is also an increase in resistance to root growth. Detrimental compaction is defined as a 15 percent increase in soil bulk density for residual soils and a 20 percent increase in bulk density for ashy soils. As discussed below, this effect is largely seasonal. These effects do have short-term impacts on overland flow, especially for summer thunderstorms. This may increase the runoff peak and cause greater

surface and bank erosion than on non-grazed soils. These effects are usually shallow, short lived, seasonal compaction on sandy loam textured surface soils.

Post-holing and plugging via hoof action shear the protective sod mats and create holes and mixing throughout, which induces a soil surface condition that is susceptible to rill and gully formation. Commonly, these areas appear hummocky and show signs of erosion between the hummocks. This can be particularly damaging around wet meadows, springs, seeps, and streams.

Bank erosion is due to sloughing caused by livestock impacts. Hoof action, rubbing and wallowing commonly causes bank failure on streams with banks composed of fine alluvium such as sand, silt, clay, and gravels. This results in more sediment delivery to the stream, especially during high flow events.

The mixing and incorporation of organic matter into surface horizons has both positive and negative impacts. Mixing helps to incorporate and conserve organic matter. It also reduces the mulching effect, which may leave the soil somewhat less protected from wind and water erosion.

Microbiotic crusts are biological in origin and formed by communities of non-vascular plants, fungi, and other associated organisms. Microbiotic crusts and the closely associated vesicular crust form a thin surface layer comprised of biotic and abiotic features. The vesicular crust along with the microbiotic crust (if present) provides a resistant layer to surface and rill erosion as well as wind erosion. Evidence points to microbiotic crusts being highly susceptible to degradation by intensive livestock trampling. Arid soils appear particularly vulnerable especially in regards to microbiotic crusts. These crusts are easily disturbed by livestock hoof action. This breaks up the crust and causes drying and increases susceptibility to wind and water erosion. Currently, no surveys for microbiotic or vesicular crusts exist in the Martin Basin Rangeland Project Area.

Animal grazing behavior influences the distribution of nutrients to various landscape positions and may have an affect on soil microorganisms. Animals may graze in one area and move to another area to rest or drink. Dung and urine may thus be more plentiful in the resting area and around a watering place than in the grazing area resulting in a net transfer of nutrients from the grazed area to the resting and watering areas. Grazing promotes nutrient cycling through the rapid breakdown of organic matter into smaller particles in the system, so organic matter is more readily available for soil microorganisms, such as soil bacteria and fungi. Microorganisms use the organic matter as an energy source and can release nutrients back into the soil for plant uptake, thus, grazing may increase the rate at which nutrients cycle through an ecosystem. It may be argued that if nutrients are not bound up in soil or organic matter, they are more vulnerable to being lost to the system.

Mycorrhizal associations and shrub-steppe habitat are closely interlinked. Livestock grazing has the potential to affect the number and health of shrubs, thereby, also affecting the mycorrhizal associations. In arid soils, shrubs establish themselves in patches or clumps and form “fertility islands”. These islands are also sites of highest vesicular arbuscular mycorrhizae (VAM) activity. These patches will be inoculum focal points from which vegetation and VAM can spread. With greater shrub establishment, adequate VAM inoculum will be concentrated to initiate mycorrhizae on later successional plants. The diversity and abundance of soil organisms is influenced not only by available food resources, but also by changes to physical and chemical properties of the soil.

The large areas occupied by grazing lands, the diversity of their climates and soils, and the potential to improve their use and productivity all contribute to the great importance of grazing lands in sequestering carbon and mitigating the greenhouse effect and other aspects of global climate change. Productive, sustainable grazing lands provide high-quality vegetation and soils,

which lead to high rates of carbon sequestration and low levels of carbon dioxide (CO2) emissions.

Vegetation and litter cover protects the soil surface from raindrop impact, slows runoff, and enhances infiltration. Reductions in the amount of vegetative cover, standing vegetation and litter results in less organic matter being incorporated into the soil, which is an important component of soil fertility and structure. As vegetative cover is decreased, there is the likelihood for increased levels of soil erosion and a downward spiral may be initiated, ultimately having a detrimental effect on Forest productivity and watershed health.

ALTERNATIVE 1 - Current Management

Direct and Indirect Effects

Levels of allowable use are established for both upland and riparian vegetative communities in Amendment 2 of the Forest Plan (USDA Forest Service 1990). These levels would remain the same. The allotments are currently managed under the direction of allotment management plans. Current grazing systems, livestock numbers, season of use, and head months would remain the same. The desired/acceptable resource conditions for riparian areas are stated in Amendment 2. Components of these desired conditions include potential key species, ground cover, soil productivity related to compaction, streambank stability, and fish production (USDA Forest Service 1990). Current grazing management practices have not adjusted forage utilization levels to improve current conditions.

As described in the Affected Environment section, the magnitude of the effects of grazing or the degree of recovery that may have occurred throughout its long history has not been measured quantitatively. Nonetheless, direct soil impacts due to grazing such as compaction, livestock trampling, soil nutrient cycling, loss of ground cover, and erosion have been well documented in scientific literature. Many of these same types of soil impacts have been observed both quantitatively and qualitatively on the monitoring sites within the project area.

Much of the monitoring data collected at the riparian sites suggests there is an adequate "A" soil present to sustain proper soil function. The primary parameters that may affect soil productivity over the long term are lack of plants with adequate rooting depth to hold soil in place, high amounts of bare ground, and soil compaction. When sites have the opportunity to regain plant rooting, vigor, and soil cover provided by plants, soil conditions should likely provide the capability to sustain the current level of soil productivity over the long term. If plant vigor does not recover, then soil productivity would likely continue to decline over the long term.

Site-specific monitoring data suggest that the riparian soil and vegetative attributes not currently functioning as desired would likely continue to display impaired functioning under the current grazing management system and would be intensified by drought conditions. The greatest degree of impairment is likely to occur in the areas predicted to be most sensitive to adverse soil impacts such as compaction, erosion, and in the areas of fragile soils.

Under current grazing management practices, compaction and upland trampling disturbances are expected to remain static. This is because with current grazing systems, livestock numbers, season of use, and head months would remain unchanged. Under current grazing management practices, negative impacts resulting from trampling, loss of ground cover, and compaction are likely to trend downward. Loss of soil is likely to continue at an accelerated rate. Soil nutrients are also likely to trend downward due to loss of organic matter caused by the effects of displacement, compaction, erosion, and reduction of vegetation biomass by livestock. Microbiotic crusts would continue to be affected under Alternative 1.

After Alternative 2 and 3, Alternative 1, as currently implemented, is the least likely to improve riparian and upland soil conditions. Alternative 1 would lead to declining soil conditions and would not address the Purpose and Need nor meet the desired conditions outlined in Chapter 1. This would result in a decline of riparian species (both herbaceous and woody) being present with less density and vigor, resulting in decreased streambank stabilization, and increases in soil erosion.

Alone, Alternative 1 cannot be expected to fully meet the resource objectives nor provide resolution to all of the resource issues because impacts from past, present and future management activities would continue to or have the potential to affect the project area. Rates of recovery or decline for both riparian and upland soils would potentially be affected by other non-grazing associated activities that would continue to occur, thus, riparian and upland conditions would improve (at a much slower pace), remain the same, or deteriorate from present conditions. Alternative 1 would improve soil conditions in the Martin Basin Rangeland Project Area at a slower rate than Alternatives 2 and 3.

Cumulative Effects

This cumulative effects analysis considers all known potential past, present, and future activities that affect surface waters of National Forest System lands within the project area, as well as private in-holdings and lands (BLM and private) immediately adjacent to the project area that are part of sub-watersheds originating on the Forest. The appropriate geographic area for soil cumulative effects analysis is also the project area. This is because soil productivity of one grazing allotment or pasture is not dependent on the productivity of an adjacent grazing allotment or pasture. Similarly, if one site receives soil impacts due to management activities and a second management that may affect soil is planned for the same site, then soil cumulative effects are possible on that site. Thus, cumulative effects to soil productivity are appropriately evaluated on a site-specific basis.

Past and present management activities, such as domestic livestock grazing (sheep and cattle), mining, fire suppression, prescribed burning, road building and maintenance, recreation and special uses have contributed to degraded riparian and upland soil conditions. Cumulatively, livestock grazing has and continues to be the single greatest landscape activity within the cumulative effects area, and likely results in the largest and most widespread detrimental effects on soil quality. The causes and effects of how grazing impacts these soil issues are explained in detail in the Affected Environment section of this document. Possible future activities/events within the cumulative effects area that may act cumulatively with grazing to affect soil quality include weather events (e.g., drought), wildfires, mining, roads, and increased recreation.

Aside from livestock grazing, of the various cumulative effects, fire has the potential to affect soil quality over the greatest area. The severity of affects to soil, ground cover, and organic nutrient conditions are determined by the intensity of temperatures and the residence time (Clark 2001).

In 2001, a wildfire started in the main stem of the Willow Creek drainage and burned across the ridgeline of the Santa Rosa Range, affecting the North Fork of Cabin Creek, South Fork of Canyon Creek, Flat Creek, South Fork of Flat Creek, Three Mile Creek, Gavica Fork of Willow Creek, and Pole Creek (Jenne 2002). Approximately 41,828 acres were burned (25,270 acres on the Forest). A number of roads were rehabilitated to prevent erosion following the fire.

Numerous other wildfires have affected portions of the project area over the past several decades. Areas that have been most affected by large scale catastrophic wildfires include the western and northern portions of the project area within the Buffalo, Granite Peak, Indian, Rebel Creek, and West Side Flat Creek Allotments. Wildfires are mentioned because of the possible cumulative

effects on soil quality, including hydrophobic soils, increased rates of erosion, loss of nutrients and soil microorganisms, all of which can decrease rangeland productivity.

Mining activities are primarily historic and are limited to areas like Spring City, Buckskin, National, and other localized sites. There are currently no active mining operations and only limited exploration activities. Mining is unlikely to have cumulative affects to soils at this time.

The Santa Rosa Ranger District has approximately 327 miles of open roads and motorized trails. Road densities are approximately 0.70 miles per square mile, which is considered low. Existing roads and trails are unlikely to result in an increase in compaction or erosion rates from what currently exist.

There is one 10 acre developed recreation site located in the project area. There are also dispersed camping areas located throughout the District that are often located near streams and other riparian areas. Localized compaction, loss of effective ground cover, and increased erosion is likely to occur in both developed and dispersed campsites. Recreational use is considered light in the area and therefore the potential cumulative affects of these activities is considered limited.

Historic and potential future livestock developments associated with grazing allotments can have a wide range of potential cumulative effects. Water developments and fences can concentrate livestock and generally increases use levels and disturbance within sagebrush and mountain brush communities. Livestock trails are susceptible to soil compaction, erosion, and invasive weed establishment. Livestock developments are located on all allotments within the project area. Livestock developments require yearly maintenance to maintain their functionality. Many of the developments are in remote areas and require the use of roads for vehicle use or trails for horses to haul tools and materials needed for maintenance.

Continued implementation of Alternative 1 would result in cumulative effects remaining unchanged in the cumulative effects area, with current conditions and trends remaining unchanged, presenting the greatest cumulative risk to riparian and upland soil quality.

ALTERNATIVE 2 - Proposed Action/Preferred Alternative

Direct and Indirect Effects

Alternative 2 sets new proper use criteria for the eight representative vegetative groups in the project area. The criterion includes maximum allowable utilization levels for herbaceous vegetation and woody vegetation. These levels of utilization vary based on the vegetative group type, meeting a desired function, not meeting a desired function, or non-functioning. Proposed utilization is for the most part, less than the current utilization levels used in Alternative 1. Compared to Alternative 1, there is an overall net reduction in forage utilization for grazing in the project area with this alternative. Additional management requirements that apply to sage grouse nesting areas, cottonwood communities, and stream/riparian areas place some limits on season of use.

Soil impacts are likely to decrease when forage utilization is decreased compared to Alternative 1. This is because a decrease in forage utilization would likely help increase plant vigor and root biomass, reduce bare ground, increase soil organic matter and nutrient cycling, break up soil compaction, improving soil infiltration and water holding capacity. The areas where forage utilization is decreased would likely recover to a desired function, in the long term, from previous grazing effects, while continuing to be grazed.

Decreased forage utilization criteria have the potential to reduce direct livestock impacts to soils compared to Alternative 1. Improved plant vigor and decreased adverse soil impacts would likely enhance soil recovery on existing impacted areas due to less forage utilization. Regardless of

these overall changes, existing detrimental soil disturbance may be perpetuated at sites where livestock congregate. Microbiotic crusts would continued to be affected but to a lesser degree than under Alternative 1.

Under Alternative 2, soil quality indicators for compaction are expected to trend upward due to less grazing pressure because of lower forage utilization. Soil nutrients are likely to remain static on sites dominated by undesirable annual or invasive plant species and trend upward elsewhere due to lower forage utilization rates. Erosion trends are likely to remain static where a site is non-functioning due to excessive soil loss. Otherwise, the erosion trends that may be attributed to improperly managed livestock grazing should be upward because of increased ground cover due to lower forage utilization.

After Alternative 3, this alternative is the best for improving riparian and upland soil conditions. The proposed proper use criteria with this alternative, which meet Forest Plan standards and guidelines, would limit the exposure of forage plants, streams, and soils to livestock grazing. Alternative 2 would also lead to soil conditions that meet the Purpose and Need and move towards the desired conditions outlined in Chapter 1, although at a slower rate than Alternative 3.

Alone, Alternative 2 cannot be expected to fully meet the resource objectives nor provide resolution to all of the resource issues as the impacts from past, present, and future management activities would continue to or have the potential to affect the project area. Rates of recovery for both riparian and upland soils would potentially be slowed or reversed by other non-grazing associated activities that would continue.

Cumulative Effects

Cumulative effects are expected to be similar to, but slightly less, than those described for Alternative 1 due to the reduction in utilization to manage for ecological condition.

ALTERNATIVE 3 - No Grazing/No Action

Direct and Indirect Effects

Alternative 3 would end grazing in the Martin Basin Rangeland Project Area immediately. Termination of grazing provides the greatest potential to restore soils to functions as desired, at the most rapid rate, in areas previously impacted by grazing (Belsky et al. 1999). With forage utilization by livestock grazing at zero percent, improved or sustained soil and plant productivity should occur due to improvements in plant vigor, increased ground cover, increased organic nutrients, and increased water-holding capacity.

For areas with high resiliency such as riparian sites, recovery would probably occur more rapidly, compared to other areas with impaired soil conditions. Recovery of vegetation may occur as soon as 3 years after livestock removal (Cole 1988).

Less is known about soil recovery of upland rangeland areas. Recovery of upland areas may take longer than riparian areas due to a lower resiliency, less moisture, and shallower soils. On the other hand, grazing intensity of upland rangeland is likely less than for riparian areas. While microbiotic crusts in some upland areas may recover within 8 to 11 years after termination of disturbance, other areas may take many decades for complete crust restoration (Kaltenecker et al. 1999). Recovery rates are dependent on many factors, including disturbance type, severity, and extent; plant community structure; adjoining substrate condition; inoculation material availability; and climate during and after disturbance (Belnap and Gillette 2001).

For upland rangelands that have a higher predicted sensitivity to compaction, trampling, erosion by water and wind, or have fragile soils, recovery may be slower compared to less sensitive upland areas. Areas where native vegetation dominates the plant community would recover more

quickly compared to areas where introduced plant species are dominant. Recovery of soil quality for these areas may require several decades.

On degraded sites with severe soil disturbance, recovery may require at least several decades. These conditions may be present where concentrated livestock use occurs within the project area. Examples include water developments, salt placement sites, and animal trailing corridors along fence lines. On sites where critical amounts of topsoil have been lost through water or wind erosion, sites where instream or meadow head cutting has resulted in a significant drop in the water table, or sites dominated by undesirable annual or invasive plant species, restoration to original condition may not be ecologically or economically feasible.

Under Alternative 3, soil quality related to compaction, riparian trampling, and upland trampling are expected to trend upward because of the cessation of livestock grazing. Soil nutrients are also likely to trend upward due to on-site retention of all organic matter rather than losses caused by the effects of compaction, trampling, erosion, and conversion of vegetation into biomass. Water erosion and wind erosion trends are likely to remain static where a site has crossed below threshold due to excessive soil loss. Otherwise, the erosion trends that may be linked to improperly managed livestock grazing should be upward due to increased ground cover caused by no forage utilization.

Under Alternative 3, most livestock water developments and allotment fences would no longer be needed. These developments would be removed over time. The removal of these developments and the fact that there would be no further developments in the future would result in a positive effect upon soil resources.

Alternative 3 would result in the quickest recovery of riparian and upland soil conditions because forage plants, streams, and soils would not be exposed to livestock grazing. This alternative would lead to soil conditions that would meet the Purpose and Need and move towards the desired conditions outlined in Chapter 1. This would result in more riparian species (both herbaceous and woody) being present with increasing density and vigor, resulting in increased streambank stabilization, and reduced head cutting, and sedimentation.

Alone, Alternative 3 cannot be expected to fully meet the resource objectives nor provide resolution to all of the resource issues because the impacts from past, present, and future management activities would continue to, or have the potential to, affect the project area. Rates of recovery for both riparian and upland soils would be potentially slowed or reversed by other non-grazing associated activities that would continue to occur. Alternative 3 would potentially improve soil conditions in the project area more quickly than Alternatives 1 and 2.

Cumulative Effects

Alternative 3 would have the greatest potential to cumulatively improve, conserve, and maintain soil productivity and function within the project area due to termination of grazing. The total cumulative effects on soil resources would generally be reduced as the potential impacts of livestock grazing would not occur. Roads, off road travel, trails, recreation sites, mining, invasive plants, fire, and naturally occurring actions and events would continue to impact soils.

Issue 3: FISHERIES AND WILDLIFE

This section presents a description of existing habitat conditions for wildlife and fisheries found in the project area and provides the basis for assessing the projected environmental effects.

Threatened and Endangered Species

Lahontan Cutthroat Trout

EXISTING CONDITION

Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi* (LCT)), native to the Lahontan Basin of eastern California, southern Oregon, and Nevada, occur within isolated streams in the project area. The subspecies was listed by the U.S. Fish and Wildlife Service as endangered in 1970 (35 FR, p. 13520) and then reclassified as threatened in 1975 to facilitate management and allow regulated angling (40 FR, p. 29864). The project is located within the range of two Distinct Population Segments (DPS) for LCT, the Northwestern Lahontan Basin DPS and the Humboldt River Basin DPS. The 1995 LCT Recovery Plan included the following as major impacts to habitat and abundance: 1) reduction and alteration of stream discharge; 2) alteration of stream channels and morphology; 3) degradation of water quality; 4) reduction of lake levels and concentrated chemical components in natural lakes; and 5) the introduction of non-native species. These habitat alterations are typically associated with agricultural use, livestock and feral horse grazing, mining, and urban development (USFWS 1995).

The major threat within the project area continues to be the presence of non-native fish that were historically introduced into project area streams. As a result, pure populations of LCT are limited within the project area. Within the Humboldt River Basin DPS portion of the project area, four creeks currently hold populations of pure LCT. Within the Northwestern Lahontan Basin DPS (Quinn River) on the Santa Rosa Ranger District, four creeks have pure populations of LCT. Of those eight streams considered to be genetically pure, six are located within the project area (Table 14).

Indicators that will be analyzed are population levels and bank stability. These indicators are discussed below along with other stream attribute measurements that are closely associated with stable banks.

Table 14. Population Levels of Lahontan Cutthroat Trout Streams within the Project Area.

ALLOTMENT	STREAM	SURVEY DATA	POPULATION
Buffalo	Andorno Creek	2001	118
	Falls Canyon Creek	1998	6
Granite Peak	Indian Creek	2000	853
	South Fork Indian Creek	2000	1,171; 448 in Tributary
Martin Basin	Long Canyon Creek	1998	1,234
West Side Flat Creek	Three Mile Creek	1997	3,203

The Nevada Department of Wildlife (NDOW) collects general aquatic wildlife system (GAWS) survey data within LCT occupied streams (Table 15). This quantitative data describes the condition of representative stream channels in the project area.

In general, LCT habitat throughout the project area is good to excellent. Latest GAWS surveys show that four of six LCT occupied streams within the project area have bank stability attributes (soil and vegetation stability) that are either considered good or excellent (Table 15). The lowest population numbers are in Andorno and Falls Canyon creeks and are a result of newly stocked recovery streams not poor habitat conditions.

Two sets of data have been collected for many of the streams (Table 15). Because there are two data sets, some general trends about specific stream conditions can be observed. Conditions on Andorno and Falls Canyon creeks have improved from fair to good/excellent. Conditions on South Fork of Indian Creek are similar between the two sample times and are considered good/excellent. Conditions on Indian Creek have degraded over time and are at the low end of what is considered good. Habitat conditions Long Canyon Creek have improved over the 5 years between sampling, with bank vegetation stability moving from fair to good.

Many areas of localized habitat problems have been observed in GAWS surveys as well as in recent properly functioning condition (PCF) assessments and sediment surveys. Localized habitat problems included unstable streambanks and erosion, lack of riparian vegetation regeneration, upland vegetation encroachment, and stream headcuts. Specific GAWS survey results on the South Fork of Indian Creek in 2000 found the stream to be stabilized mainly by cobble substrate. Ungulate (deer, elk, cattle) damage from the 2000 survey was rated at 33.4 percent.

A low width/depth ratio of less than 10 is considered ideal for a stream channel (US Forest Service 1995). Streams with low width/depth ratios are narrow and deep, tend to have lower water temperatures, and are better able to transport sediment and maintain channel integrity. The streams measured all had width/depth ratios greater than 10 (Table 15). Two LCT streams were found to have moderate width/depth ratios, 14.47 and 16.0, in Falls Canyon and Andorno creeks, respectively. The width/depth ratios at Indian and South Fork Indian creeks were considered high, 21.84 and 34.63, respectively. The ability of these streams to transport sediment and maintain channel integrity has been reduced. No width/depth ratio data is available for Three Mile or Long Canyon creeks.

Canopy density is a parameter that measures the amount of cover streambank vegetation provides over the streams. Ideally, a stream should have 100 percent canopy density. Lahontan cutthroat trout streams measured in the project area had canopy densities from 51.8 to 77.0 (Table 15). Streams with the lower canopy densities are likely to have higher water temperatures due to the lack of shade. Optimum bank soil stability is considered to be excellent with greater than 80 percent plant density, 65 percent of the upper bank comprised of large angular boulders, and less than 25 percent of the bank under stress or eroding. Bank vegetation stability is a parameter that gives an indication of streambank condition, which determines how well a streambank will withstand erosion during high stream flows. A stable bank will be covered by vigorous vegetation and/or have rock material, which bind streambank soils. Conditions on Three Mile Creek are not at desired levels according to surveys in 1997 and 2001 (Table 15). Bank soil stability and vegetation stability ratings were 55.7 percent and 56.2 percent. Riparian assessments on Three Mile Creek and South Fork Indian Creek in July 2006 found the stream to be in satisfactory condition, including bank stability (US Forest Service 2006).

The ungulate (deer, elk, cattle) damage rating is an indicator of physical damage (e.g., bank sloughing) that animal hoofs cause to a streambank. Most streams were determined to have only slight or moderate damage (Table 15).

Table 15. Habitat Condition of Lahontan Cutthroat Trout Streams within the Project Area.

ALLOTMENT	STREAM	SURVEY DATE[1]	WIDTH/ DEPTH RATIO[2]	CANOPY DENSITY[3]	BANK SOIL STABILITY[4]	BANK VEGETATION STABILITY[5]	UNGULATE DAMAGE RATING[6]
Buffalo	Andorno Creek	2001	16.00	77.0	86.5	91.0	None
		1996		64.0	65.5	79.5	0.4
	Falls Canyon Creek	1998	14.47	51.8	81.6	80.2	16.1
		1986			49.2	54.0	35.2
Granite Peak	Indian Creek	2000	34.63	62.1	72.9	74.3	33.4
		1995			89.1	89.8	4.4
	South Fork Indian Creek	2000	21.84	73.9	72.9	91.3	33.4
		1995			90.0	91.0	4.4
Martin Basin	Long Canyon	1998	No Data	58.0	65.4	73.2	None
		1993		37.0	63.6	63.2	26.2
West Side Flat Creek	Three Mile Creek	1997	No data	53.1	55.7	56.4	46.9

(Source: Nevada Department of Wildlife GAWS).
[1]Data presented for each stream is from latest GAWS survey. Data are a calculated average for each parameter over the entire stream.
[2]Low flow-wetted width/depth ratio.
[3]Optimum is considered to be excellent canopy coverage (100%).
[4]Optimum considered to be excellent with >80% plant density, 65% of upper bank material large angular boulders, <25% of bank under stress or eroding. (Fair= 40-69%;Good=70-89%; Excellent=90-100%)
[5]Optimum is >80% of streambanks covered by vegetation in vigorous condition or by boulders and rubble. (Fair= 40-69%;Good=70-89%; Excellent=90-100%)
[6]Optimum is considered 0%-20% bank damage from ungulate use. Little or no bank erosion or sloughing.

ENVIRONMENTAL CONSEQUENCES

When livestock grazing is properly managed riparian and stream habitat conditions are maintained that support healthy and sustainable populations. Prime trout waters are clear, clean, and cold, and substrates are relatively silt-free. Cover is an important habitat component (Hickman and Raleigh 1982). Trout occupy areas with overhanging banks, vegetation, or woody debris, and within stream cover (e.g., brush, aquatic vegetation, and rocks) that are important for juvenile survival (USDA Forest Service 1993).

Improper livestock grazing can lead to a reduction in the amount of trout habitat available within streams. Livestock grazing can detrimentally affect the watershed, streambanks, channel substrate, and stream channel morphology; increase the frequency and severity of flooding; reduce aquatic habitat complexity and riparian vegetation; and may indirectly reduce the amount of perennial surface flow (Platts 1985, Platts 1991). Concentrations of livestock in the riparian area can cause alteration of riparian areas, loss of undercut banks and other cover, exposed stream channels, increased silt loads, and wider and shallower streams that ultimately cause elevated water temperatures during the summer and colder temperatures during the winter (USFWS 1995).

Behnke and Zarn (1976) identified improper livestock grazing as the greatest threat to the integrity of stream habitats in the western United States. Numerous publications have documented the detrimental effects of heavy livestock grazing on streams and riparian areas. Livestock grazing can detrimentally affect the watershed, streambanks, channel substrate, and stream channel morphology, increase the frequency and severity of flooding, reduce aquatic habitat complexity and riparian vegetation, and it may indirectly reduce the amount of perennial surface flow (Platts 1985, Platts 1991). Such disturbances lead to detrimental impacts to important habitat components such as prey availability, cover, spawning gravels, and water temperatures.

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under current management, riparian areas occupied by LCT are classified as Category 1 riparian areas. The desired conditions for Category 1 riparian areas are as follows:

- Potential key species (herbaceous and woody) are present, reproducing, and have high vigor.
- Cover of key species is 90 percent or greater of estimated potential.
- Soil productivity has not been significantly reduced as evidenced by no more than 10 percent reduction in macro-pore space from estimated potential.
- Streambank stability is at least 90 percent of estimated potential.
- Fish production is estimated to be near potential.

Current management manages streambank stability in LCT streams to be at least 90 percent of their potential. This direction in areas occupied by LCT would promote clear, clean, and cold streams with stream substrates that are relatively silt-free. Impacts to important habitat components such as prey availability, cover, spawning gravels, and water temperatures from livestock are minimal.

Although all LCT streams, have a maximum utilization levels of 45 percent (except Falls Canyon Creek, 35%), there have been occasions when this level has been exceeded or management of the allotment has lead to degraded riparian conditions. This is also true in LCT areas with degraded streambank conditions. In streams with LCT that do not meet the above desired conditions, following current management direction allows for improved bank stability, healthier riparian areas, and maintenance of LCT populations that are near estimated potential.

Under Alternative 1, livestock would have direct access to stream channels occupied by Lahontan cutthroat trout. This direct assess can result in “take” of LCT as a result of different life stages being trampled or displaced by cattle. Indirect effects to LCT habitat may also occur through bank disturbance, sedimentation, water quality degradation, and changes to channel morphology. These changes can lead to detrimental impacts to important habitat components such as spawning gravels and water temperatures. These direct and indirect effects can result in adverse affects to LCT and LCT habitat.

Should recovery efforts reintroduce LCT back into unoccupied streams currently under less restrictive management, these areas would be classified as Category 1 riparian areas with more the restrictive managed required.

Cumulative Effects

Cumulatively, livestock grazing is the most widespread activity with the longest duration in the area, starting the in late 1800s. Impacts to the landscape, as noted previously, have been extensive, and impacts to streams and riparian areas are particularly well documented.

Along with livestock grazing, the introduction of non-native trout are thought to be the primary causes leading to the decline of Lahontan cutthroat trout. The first known stocking of non-native fish into a LCT stream in Humboldt County was July 1896 when rainbow trout and brook trout were stocked into the Quinn River. Not all stocking activities have been documented; however, it is assumed that perennial streams with adequate access were stocked with non-native fish (NDOW 1999). Hybridization with rainbow trout has been found throughout the Santa Rosa Range, and along with habitat degradation, a corresponding loss of LCT has been documented. Due to either direct competition or hybridization, LCT populations have been extirpated or greatly reduced.

Other activities that have cumulatively affected stream habitats, fisheries, and particularly LCT, both within the project area and at the watershed scale outside of the project area, include recreation, road construction and maintenance, mining, water diversion and development, and the spread of noxious weeds.

Recreation and dispersed camping alongside roads in riparian areas have also contributed to stream impacts by reducing vegetation and trampling streambanks. Use of OHVs has increased the number of new roads in the area and has allowed more access along streams which also leads to unstable streambanks.

Roads are found along side and/or crossing many streams on both public and private land. Of particular concern is the road adjacent to Indian Creek. Roads can impact watersheds in several ways including: alteration of channel morphology, alteration of runoff regimes, increase of fine sediment levels in streams, reduced riparian vegetation and cover, and confinement of channel (particularly when roads are placed directly next to streams on adjacent floodplains). Where roads intersect streams, culverts, or bridges can create migration barriers or completely block fish movement. Maintenance of roads continually inputs more fine sediment into the watercourse.

Overall, the Travel Management Project on the District reduced the amount of unauthorized use in LCT occupied and recovery streams. In occupied or tributaries to LCT occupied streams, the miles of unauthorized routes within 300 feet of perennial streams and 150 miles of intermittent streams that were closed, were 0.1 miles and 2.4 miles respectively. The project also reduced the number unauthorized crossings of perennial and intermittent streams. This reduction of use within riparian areas associated with LCT streams will increase streambank stability and lead to a reduction of sedimentation in degraded areas.

The Santa Rosa Range has also been the site for mining activity. Of special concern is the acidic pH and high sulfate levels currently found in the North Fork Little Humboldt River downstream of the Buckskin Mine. No fish or aquatic invertebrates are found in the river until 2 miles downstream of the area.

Agricultural diversions occur on many of the streams in the area, found mostly on privately owned land or on lands administered by the BLM. The diversions depend on a reliable water supply from upstream sources on the Forest. Effects to the water source such as alterations in channel morphology leading to channel incision can cause changes to water retention along the riparian zone. This can amount to less water being available during low flow periods. In some cases, water removal would result in reduced quantity and quality of habitat for trout. Many of the streams in the area do not persist much beyond the point of diversion due to dissipation onto alluvial fans as streams flow off the mountain. Unscreened diversions can also trap fish causing direct mortality.

Some natural processes outside the control of the Forest have contributed to cumulative effects to aquatic resources. These processes include wildfire and drought. The Santa Rosa District is particularly susceptible to wildfire due mainly to existing moisture regimes and conversion of

native vegetation species to cheatgrass. Fires tend to spread quickly and burn hotter than in other areas. Extensive wildfires along riparian areas can lead to bare ground along streambanks. Resulting conditions can lead to increased sediment inputs from eroding banks.

In 2006, the Three Mile Riparian Exclosure was built to improve habitat for the threatened Lahontan cutthroat trout on the West Side Flat Creek Allotment. This 1-mile long exclosure excludes livestock from the lowest third of the stream where riparian concerns exist as a result of cattle concentrating along the stream. In 2007, cottonwood seedlings were planted along the stream within the exclosure. Site visits in the area during 2007 and 2008 indicate that the condition of riparian vegetation appears to be improving and streambanks are showing slight improvement in stability.

Across the historic range of the LCT, these activities have lead to the listing of the species under the Endangered Species Act of 1970. The status as a threatened species will continue in the project area and throughout its range regardless of current management. Alternative 1 does protect currently occupied stream habitats but it does little to promote protection of stream habitats that may be important to future recovery actions. However, it does allow for more restrictive management once LCT are reintroduced into a currently unoccupied stream.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Under Alternative 2, riparian areas occupied by LCT would be managed at similar levels to those described under Alternative 1. Current utilization levels for LCT occupied streams within the project area range between 35 to 45 percent. Under Alternative 2, the highest utilization allowed under any grazing system would be 45 percent within riparian areas. Both Alternatives 1 and 2 contain direction that promotes maintaining riparian habitats in a desired condition. Reaching these desired conditions under both alternatives would maintain healthy and stable stream conditions and LCT populations. Therefore, direct and indirect effects to existing LCT populations and occupied habitats are expected to be the same under this alternative as describe under Alternative 1.

Similar to Alternative 1, under Alternative 2 livestock would have direct access to stream channels occupied by Lahontan cutthroat trout. This direct assess can result in “take” of LCT as a result of different life stages being trampled or displaced by cattle. Indirect effects to LCT habitat may also occur through bank disturbance, sedimentation, water quality degradation, and changes to channel morphology. These changes can lead to detrimental impacts to important habitat components such as spawning gravels and water temperatures. These direct and indirect effects can result in adverse affects to LCT and LCT habitat.

Streambank bank stability and LCT population level are also expected to be similar to those described under Alternative 1 in streams where LCT are present.

Where Alternative 2 varies from Alternative 1 is in areas currently managed as Category 3-4 riparian areas. Within potential LCT recovery streams (USFWS 1995) which are within Category 3-4 riparian areas, management under Alternative 2 is expected to improve general stream and riparian habitat.

Depending on the current management system, percent utilization varies from 50 percent under a season long grazing system to 65 percent for a high intensity short duration system. Under Alternative 2, the highest utilization allowed under any grazing system would be 45 percent within riparian areas. There would be reduced utilization of key riparian species, such as aspen, cottonwood, and willow by livestock. Thus, management actions would move conditions within unsatisfactory riparian habitat toward satisfactory conditions by allowing for less utilization of

these key riparian species by livestock. With the reduced levels of use on riparian species, there should be an increase in the health, vigor, and productivity of these species, thus increasing the quality and availability of riparian habitat slowly overtime.

A lower utilization level in riparian areas would reduce the amount of time streambanks are subject to livestock use. Fine sediment levels are expected to be lower under Alternative 2 due to improved streambank conditions and riparian vegetation in streams within the project area. Thus there would be a movement toward meeting desired conditions.

This movement toward satisfactory habitat conditions in Category 3-4 riparian areas would be accelerated within unsatisfactory stream reaches compared to Alternative 1 (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, attachment 3). An evaluation of whether riparian vegetation and stream conditions are moving towards satisfactory conditions with implementation of Alternative 2 would be accomplished with long-term effectiveness monitoring as identified in Chapter 2.

Current streambank conditions are expected to improve under Alternative 2 in LCT potential habitats.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The status of threatened species for LCT would continue in the project area and throughout its range regardless of implementation of Alternative 2. The proposed action would protect currently occupied stream habitats and reduce effects to LCT habitats that may be important future recovery actions.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock would be removed from each allotment. Once livestock are removed, stream function would move closer to its natural potential. Over the long-term existing vegetation is expected to increase in vigor and density, which would trap more sediment and decrease bare ground and erosion. Sedimentation as a result of livestock presence on streambanks would be eliminated. No grazing in areas occupied by LCT or other trout species would promote clear, clean, and cold streams with stream substrates that are relatively silt-free. Impacts to important habitat components such as prey availability, cover, spawning gravels, and water temperatures from livestock would be completely eliminated under this alternative.

Under Alternative 3, livestock would not have direct access to stream channels occupied by Lahontan cutthroat trout. No adverse affects to LCT or LCT habitat are expected.

Current streambank conditions are expected to improve more under this alternative when compared to the other alternatives. Lahontan cutthroat trout and trout population levels would continue to fluctuate over time as currently occurs; however, resulting population levels would be expected to be higher under this alternative as compared to the other alternatives.

Cumulative Effects

Cumulative effects associated with Alternative 3 would be similar to those disclosed under Alternative 1. The status of threatened species for LCT will continue in the project and throughout its range regardless of implementation of Alternative 3. No grazing would reduce cumulative effects to habitats within the project area that are currently occupied by LCT and those that may be important in the future.

Forest Service Sensitive Wildlife Species

Sensitive species are determined by the Regional Forester (FSM 2670) and are those species for which population viability is a concern. The "sensitive" determination of individual species is based on "significant current or predicted downward trends" in: 1) population numbers or density or 2) habitat capability that would reduce a species' existing distribution (USDA Forest Service 1995, FSM 2670). In 1990, Region 4 compiled a species list by Forest; this list was revised in November 2003. The species list was used to determine what species might be present in the project area or its area of influence.

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA) and Forest Service Manual (USDA Forest Service 1995, FSM 2670). The Humboldt National Forest Land and Resource Management Plan (LRMP) directs districts to protect and improve wildlife habitat and to manage for "classified" (federally listed) species.

Forest Service sensitive species for which suitable habitat may exist within the project area include: Greater Sage-grouse, northern goshawk, western big-eared bat, spotted bat, flammulated owl, and pygmy rabbit. Forest Service sensitive species for which suitable habitat or species are not present on the District or within the project area include: Bonneville cutthroat trout, Columbia spotted-frog, peregrine falcon, bald eagle, mountain quail, great grey owl, and three-toed woodpecker.

Greater Sage-grouse

AFFECTED ENVIRONMENT

The Greater Sage-grouse (*Centrocercus urophasianus)* was selected as the Management Indicator Species (MIS) for healthy and productive sagebrush communities. The life cycles of sage grouse: nesting, breeding, foraging, brood rearing, and wintering habitats have a strong association with sagebrush communities, as well as associated vegetation/herbaceous communities within sagebrush habitat. Sagebrush habitat in relationship to lek locations have been incorporated into both the forest-wide and project area habitat capability/suitability modeling (USDA Forest Service, MB MIS/Range Capability Report 2008).

Based on Forest vegetation modeling, there are approximately 126,500 acres of potential sage grouse habitat within the project area. Forest sage grouse modeling was based on vegetation types, canopy cover, and distance from mapped leks. Five classes of habitat were determined (Table 16).

Table 16. Satisfactory and Capable Nesting and Foraging.

GREATER SAGE-GROUSE NESTING AND FORAGE HABITAT	
Satisfactory Nesting	Areas within 2 miles of a lek and 55% of canopies of sagebrush vegetative types* between 10 and 30%.
Satisfactory Forage	Areas beyond 2 miles of a lek and 55% of canopies of sagebrush vegetative types* between 10 and 30%.
Capable Nesting	Areas within 2 miles of a lek and less than 55% of canopies of sagebrush vegetative types* between 10 and 30%.
Capable Forage	Areas beyond 2 miles of a lek and less than 55% of canopies of sagebrush vegetative types* between 10 and 30%.
Not Capable	All other vegetative types (not mapped).

* Sagebrush vegetative types considered are Wyoming big sage, low sage, mountain big sage.
Two mile criteria and canopy derived from Connelly et al. 2000; canopies adjusted by local ground knowledge of lek/habitat sites on the Humboldt-Toiyabe National Forest.

Site-specific information and local knowledge from District personnel and NDOW biologists of sage grouse locations and known habitat use was used to identify a smaller analysis area within the project area that actually reflected sage grouse distribution within the project area. A project level model was run on the project area. This model identified approximately 81 percent (64,264 acres) of Wyoming big sage, low sage, and mountain big sage is in 10-30 percent canopy cover. This information suggests these communities are in relatively good condition for sage grouse nesting and brooding (Table 17). However, these assumptions are based on local knowledge of the area that sagebrush stands with less than 30 percent canopy cover provide the best nesting and brooding habitat for sage grouse. Within the project area, between 81-89 percent of capable nesting habitat is in satisfactory condition with the grass component. Understory vegetation such as grasses and forbs are a significant component of suitable nesting habitat and are under represented in the modeling.

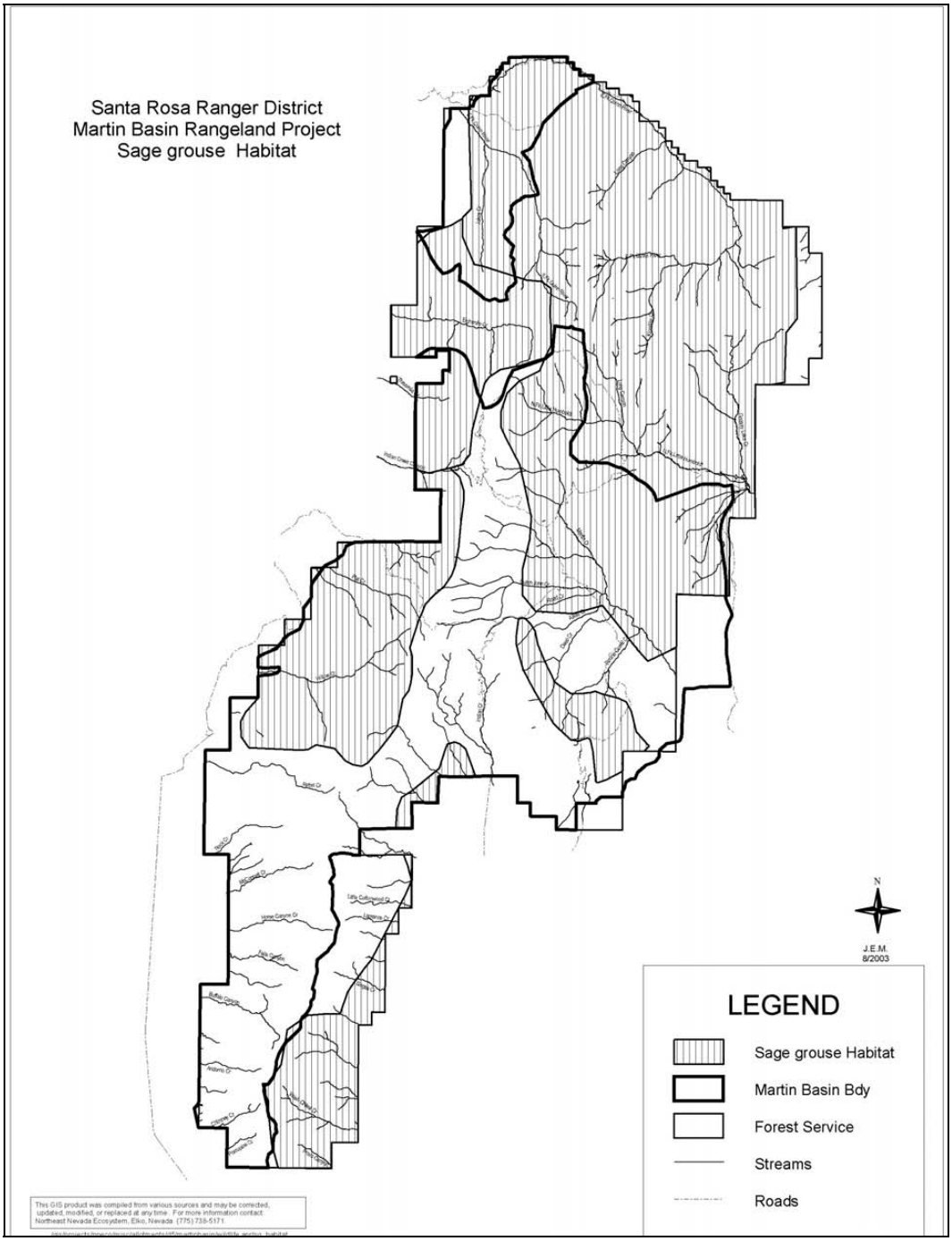
Table 17. Greater Sage-grouse Nesting and Brooding Habitat.

ALLOTMENT	GREATER SAGE-GROUSE NESTING AND BROODING HABITAT (acres)			
	Less than 10% Shrub Cover	10 – 30% Shrub Cover*	31%+ Shrub Cover*	Total by Sage Species
Bradshaw	0	3,172	119	3,291
Buffalo	32	63	51	145
Buttermilk	531	9,491	557	10,579
Granite Peak	1,769	8,550	3,089	13,408
Indian	850	12,906	542	14,298
Martin Basin	250	20,389	561	21,201
Rebel Creek	1	239	74	314
West Side Flat Creek	2,736	9,454	3,939	16,130
GRAND TOTAL	6,170	64,264	8,933	79,366
Percent of Sagebrush Habitat by Cover Type	8%	81%	11%	

*Sagebrush cover types considered are Wyoming big sage, low sage, mountain big sage.

Map 4 represents the site-specific information and local knowledge from District personnel and NDOW biologists about sage grouse distribution within the project area (J. Jeffers, personal communication 2003). This map displays the known dominant sage grouse habitats; however, small areas of potential habitats may occur outside of those identified on the map. Within the project area, springs, seeps, meadows, riparian areas, and high elevation sagebrush basins provide important brood rearing habitats. These areas provide water, succulent forbs, and insects, which are important to young sage grouse. Important brood rearing habitats within the project area are found within the Bradshaw, Buttermilk, Indian, and Martin Basin Allotments. These habitats also occur within the Granite Peak and West Side Flat Creek Allotments. Overall, the sage grouse's need for sagebrush influences the species occurrence in the use of the project area. Potential wintering habitats occur on the Buttermilk, Granite Peak, Indian, Martin Basin, and West Side Flat Creek Allotments. Most of the known leks are concentrated on the northern half, outside the project area. Leks and nesting habitats within the project area are most common on the Bradshaw, Buttermilk, Indian, and Martin Basin Allotments. Leks and nesting habitats also occur on or near the Granite Peak and West Side Flat Creek Allotments. There are no known leks and only limited habitats on the Buffalo and Rebel Creek Allotments.

Map 4. Dominant Greater Sage-grouse Habitat on the Santa Rosa Ranger District.



ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, livestock grazing would primarily affect the quality of brood rearing habitat for sage grouse within riparian areas, wet meadows, and springs that are currently at less than desired conditions. Riparian meadows that are not moving toward desired condition within sage grouse habitat would likely continue in this trend. Past grazing practices and current utilization standards (45-65% in wet meadows and other riparian areas and 65% in upland herbaceous vegetation) in some areas (particularly in springs and meadows) have resulted in a reduction of the quantity and quality of forbs available for attracting insects for sage grouse hens and their broods, and a reduction in the amount of cover available to successfully escape from predators. Localized and concentrated use by livestock under current management may also reduce understory grass cover, which may impact the quality of nesting habitat in the following year. In general, this impact would be localized as most upland (current) utilization standards are generally not reached; however, sites near water sources and salting locations may be impacted due to heavier use. There is also the potential for nests to be damaged or destroyed by livestock trampling.

Within the project area, the potential impacts on wintering habitats are limited. Livestock are not present on the allotments at this time of the year. Potential impacts could occur in areas where cattle may concentrate on upland habitats. In these areas there is the potential for cattle to trample sagebrush plants, which can affect the quality of winter forage for sage grouse.

Based on current management and livestock use, it is expected that there would be no change in conditions in terms of moving unsatisfactory sage grouse habitat toward satisfactory.

Cumulative Effects

Improperly placed water developments may impact springs and meadows while water troughs can concentrate cattle in areas that may impact important sage grouse nesting, brood rearing, and summer habitats. Recreational activities such as motor vehicle use and dispersed camping can have limited effects on potential habitats for sage grouse by altering or damaging vegetation resources from camping or driving in aspen stands or meadow systems. Recreational activities in the cumulative effects area are limited and generally impact very few acres.

Mechanical vegetation treatments are a short-term impact on habitat, but because the scope of treatments are focused and can avoid sensitive areas, they provide accelerated improvements over time. While the acreage of the impacts may be relatively small, mineral exploration is expected to continue. These effects usually include temporary road construction, pad development, and human disturbance.

The cumulative effects resulting from the Buttermilk Prescribed Burn are also limited. Although the prescribed burn treated approximately 2,100 acres, it occurred during the cool spring and created a mosaic pattern, which limited the impacts to sage grouse. In some cases short-term improvements occurred due to increases in forbs and other vegetation important to grouse during the summer. Approximately 500 acres of potentially suitable habitat was also affected by the Buttermilk mechanical treatments. The adverse impacts from these treatments were also limited and the treatments will result in some short-term and long-term benefits to sage grouse. Wildfires within the northern and western portions of the cumulative effects area have had long-term adverse effects upon sage grouse and their habitats. Although many of these areas have begun to recover, there are still years remaining before full recovery is obtained.

The potential impacts of vegetation treatments, prescribed burns, mineral exploration, and dispersed recreation are generally limited in scope and/or timing and impact only a small percentage of the total available habitats for sage grouse. The cumulative effects of these activities when compared to the effects associated with livestock grazing are considered minimal. These impacts are cumulative to grazing impacts which include alteration of understory vegetation components and damage to mature sagebrush stands which causes a decrease in canopy closure.

Wildfires result in the long-term loss or alteration of habitats. Other cumulative activities such as recreation, prescribed burns, mechanical treatments, and livestock grazing can alter habitats and reduce the quality of those habitats. However, these activities generally do not result in the loss of those habitats. Tens of thousands of acres of suitable habitats occur within the cumulative effects area in locations that have not been treated, burned, or adversely impacted as a result of activities that concentrate livestock.

Fences associated with livestock grazing activities also pose a risk to sage grouse both as a hazard to grouse flying as well as providing perches that can be used by raptors. These impacts can result in the loss of individual sage grouse within the cumulative effects area.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread of noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning; and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce these negative effects to wildlife.

In 2007, the District implemented a small wetland project on the Martin Basin Allotment. An old stock pond was dredged to provide wetland habitats for birds, amphibians, and other wildlife species. The pond and associated spring were then enclosed within a 5+ acre exclosure to protect the site from livestock grazing impacts. This project provides water and additional forage for sage grouse. During site visits in 2008, waterfowl, shorebirds, and various other birds were observed using the site and the pond contained thousands of Pacific chorus frog tadpoles.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Alternative 2 would implement management changes to begin moving upland areas towards desired condition. Livestock grazing under Alternative 2 is expected to impact potential habitats for sage grouse through grazing of grass/forb cover, trampling, and trailing along fences or in seep and spring areas. Since the utilization proper use criteria in uplands would result in less livestock use/presence in the habitat, these associated livestock impacts may be less with this alternative than with Alternative 1. Habitats of concern tend to be located near sites where cattle concentrate such as near salt locations, water developments, and along fences.

Following implementation of the proper use criteria, management in the areas where concerns exist would be adjusted to result in an upward trend in condition. After the Matrices have been considered in evaluating the uplands, riparian areas, wet meadows, and springs, there are a variety of management strategies that would be put into place (see Appendix D) to reduce the impacts of

livestock grazing to those areas that are not in desired condition. Utilizing various management strategies to reduce the impacts to these areas would allow for faster recovery and reduce impacts to important sage grouse habitat. This would allow livestock use within these habitats while maintaining sufficient vegetation resources to provide forage and cover for the sage grouse to aid in the recovery of the species. Under this alternative, sage grouse populations are expected to remain relatively stable or increase within the project area.

Management actions would move conditions within unsatisfactory sagebrush habitat toward satisfactory conditions by allowing residual grass/forb cover to establish and be maintained within sagebrush communities, including wet meadow and spring sites important for brooding habitat. An evaluation of whether sagebrush and meadow vegetation conditions are moving towards satisfactory conditions with implementation of Alternative 2 would be accomplished with long-term effectiveness monitoring as identified in Chapter 2.

Approximately 81-89 percent of the capable nesting habitat within the project area is supporting habitat in satisfactory condition. With management actions under Alternative 2, sagebrush nesting habitat currently in unsatisfactory condition should move toward satisfactory nesting habitat (allowing for residual grass/forb cover to establish and be maintained within sagebrush communities) resulting in a slight upward trends in nesting habitat. Brood rearing habitat would also improve with more post-grazing residual vegetation. This could result in a slight increased change in the distribution of sage grouse within the project area. To maximize efforts to recruit satisfactory nesting and foraging habitat for sage grouse active implementation (i.e., mechanical treatment or use of prescribed fire in mature sagebrush and mountain brush communities) of restoration strategy would be necessary and would not be accomplished with Alternative 2 alone.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The potential cumulative effects related to impacts to vegetative communities used by sage grouse would be reduced as a result of lower utilization proper use criteria in some vegetative communities. The communities with the most notable changes as it relates to sage grouse include springs, meadows, and other riparian areas, as well as sagebrush communities adjacent to these riparian areas.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, it is expected that habitat conditions within the sagebrush community would recover in a shorter time frame than with the other alternatives. More grasses/forbs would be left for nesting cover and foraging. Impacts to habitat from trampling and trailing would recover and no longer be a potential risk to sagebrush habitat. Removal of fence posts could reduce potential perch sites for avian predators, thus reducing this mortality factor. Removing other range improvements, especially water developments, would probably pose an adverse impact to the species in terms of reducing the amount, availability, and distribution of water, resulting in localized decreases in carrying capacity for sage grouse. Removal of water developments would be subject to additional evaluation and analysis, especially in regards to wildlife habitat needs.

Alternative 3 would achieve similar results as Alternative 2, but would cumulatively increase residual vegetation over time instead of that which is recruited under Alternative 2. To maximize efforts to recruit satisfactory nesting and foraging habitat for sage grouse active implementation (i.e., mechanical treatment or use of prescribed fire in mature sagebrush and mountain brush communities) of restoration strategy would be necessary and would not be accomplished with Alternative 3 alone.

Cumulative Effects

Under Alternative 3, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area. This alternative may, however, result in additional livestock grazing impacts within meadows and mature sagebrush communities on private lands in the surrounding valleys. There may be more pressure to treat sagebrush communities to provide for increased grazing capacity for livestock displaced from National Forest System lands. These treatments may alter habitats for sage grouse on private lands. Under this alternative, the potential cumulative effects may be displaced from habitats on National Forest System lands to habitats on adjacent private lands.

As livestock grazing is eliminated from the project area there would be an increase in residual vegetation. With this increase in fine fuels, there may be some increase in the frequency of wildfires. The potential increase in the frequency of wildfire would be minimal at higher elevations; however, lower elevation sagebrush communities may see increased cumulative effects associated with wildfire, in particular where cheatgrass is a serious problem. This alternative may result in an increased loss of lower elevation sagebrush communities which are important to wintering sage grouse populations.

Northern Goshawk

EXISTING CONDITION

The northern goshawk (*Accipiter gentilis)* was selected as the MIS for late seral aspen, cottonwood, and fir on the Humboldt National Forest. In Nevada, aspen is the most commonly used nesting habitat, with 85 percent of the observed nests found in this vegetative community (Herron et al. 1985).

There have been several reported sightings of goshawks on the Santa Rosa Ranger District. A formal survey was conducted in the early 1990s. At the time of the survey, three active territories were identified. Field work indicated those three territories are actually three alternative nests within one nesting territory in the Road Creek and Lye Creek drainages (B. Bauman, personal communication 2006). In April 2006, NDOW completed helicopter flights over aspen stands on the Santa Rosa Ranger District to identify existing nests. Raptor nests are easily identified from the air and were mapped using a global positioning system (GPS) unit. These nests were then visited to verify whether a nest was active and what bird species occupied the nest. Red-tailed hawks, Cooper's hawk, and great horned owl are the most common birds that nest in the large stick nests that were identified. These field surveys indicated active goshawk territories in Abel, Deep, Andorno, and Lye creeks, as well as Horse Canyon. Habitat capable of supporting goshawk territories can be found along Cabin, Road, and Flat creeks. Thus, approximately four nest territories are present in the project area. The Lye Creek territory appeared to be active this year.

Based on occupancy of these goshawk nesting territories, the Forest has been working with the NDOW to establish population trend and distribution across the District and Forest. The Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006) is used to identify survey grids across the landscape. Based on these preliminary detections using the new survey method, goshawks are as abundant, as when the original population estimates were determined for the Humboldt Land and Resource Management Plan (USDA Forest Service 1986).

A critical element for goshawks on the Santa Rosa Mountain Range is the presence of aspen stands or stringers of aspen that follow the drainages. Within the Santa Rosa Ranger District, there are approximately 19,770 acres of aspen stands, comprised of aspen and riparian aspen

vegetation layers. A total of 15,043 acres of aspen were mapped throughout the project area (Table 18). Applying the total number of aspen acres with the modeling criteria, this estimate of nesting habitat that occur within 0.25 mile of all perennial water sources within the project area was refined. Capable and satisfactory northern goshawk nesting and foraging habitats for the project area are displayed in Table 18. This analysis shows there are a total of 3,846 acres of suitable nesting habitat within the project area.

Table 18. Aspen Acres by District and Project.

VEGETATION TYPE	SANTA ROSA RANGER DISTRICT (acres)	MARTIN BASIN RANGELAND PROJECT (acres)
Aspen	16,567	12,598
Riparian Aspen	3,203	2,445
Total	19,770	15,043

These acres were taken from District and project level modeling runs (September 2008).

Two types of habitat models were used for goshawk nesting and foraging habitat. The modeling parameters for nesting habitat consist of:

- Aspen – includes upland aspen, riparian aspen, mixed aspen/conifer, cottonwood, and 1 acre preliminary aspen for the Remote Sensing Applications Center (RSAC).
- 0.25 mile to water sources – includes perennial streams, springs, ponds, and all riparian vegetation types (grass, shrub, aspen, cottonwood).
- Slopes less than 30 percent.
- Elevation between 6,000 and 10,500 feet.

The modeling parameters for foraging habitat consist of:

- Mile buffer around nesting habitat.
- All tree and woodland types.
- Shrub and herbaceous types within 0.25 mile of tree and woodland types.

Table 19 displays the amount of goshawk habitat by allotment.

Table 19. Goshawk Habitat in the Project Area.

ALLOTMENT	POTENTIAL NESTING HABITAT ACRES	PERCENTAGE OF ALLOTMENT
Bradshaw	9	3%
Buffalo	2,973	14%
Buttermilk	2,760	8%
Granite Peak	3,432	8%
Indian	341	2%
Martin Basin	1,220	4%
Rebel Creek	3,144	20%
West Side Flat Creek	1,162	6%
TOTAL	15,041	

Based on habitat modeling the following table displays the capable and satisfactory habitat within the project area (Table 20). The vegetation condition for aspen is functioning and in an upward trend across most of the project area; therefore, goshawk habitat in the project area is considered stable. There are some issues with smaller aspen stands or stands near the lower elevation range of aspen that are being impacted by livestock. These areas would not be considered nesting habitat, although they could be used for foraging.

Table 20. Capable and Satisfactory Goshawk Habitat in the Project Area.

CAPABLE AND SATISFACTORY FORAGING HABITAT		CAPABLE AND SATISFACTORY NESTING HABITAT
Forest	Shrub	
17,017	64,667	3,846

These acres were taken from project level modeling runs (September 2008).

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1 there are localized aspen habitats where aspen regeneration is being impacted by livestock grazing and long-term sustainability of those stands would be questionable due to insufficient regeneration. The areas of greatest concern are generally lower elevation aspen stands, stands of small size, or stands associated with isolated springs, aspen adjacent to meadows, or sites where historical water developments were placed within or immediately adjacent to aspen stands. These sites are areas where cattle concentrate and impact aspen regeneration (livestock tend to congregate in the shade of aspen stands, often resulting in soil compaction and reduction in aspen suckers). Most aspen habitats under current management would have sufficient aspen regeneration to provide long-term habitats for both northern goshawks and their prey species. Foraging habitat in open, treeless areas could be affected from grazing by reducing the amount of food and cover for species, such as the Belding ground squirrel (Younk and Berchard 1994).

Current livestock grazing standards in these aspen stands range from 35 to 65 percent of herbaceous vegetation. There is no livestock utilization level set for the actual grazing (use) of aspen currently. Aspen stands are often the places livestock tend to congregate as they provide shade and moist forage during the hot summer months, as documented within the project area in the Buttermilk Allotment, North Fork of Cabin Creek, and several other streams. Many of the riparian areas in the project area are currently “at risk” or are showing a downward trend in ecological condition. The literature shows that as herbaceous use increases, livestock use begins to become more visible on woody vegetation such as willow and aspen (Clary and Webster 1989). This leads to a loss of diversity of trees (especially the recruitment of young trees) and shrubs, and causes soil compaction - all which limit aspen habitat.

Diversity within aspen stands is critical to support an adequate prey base and for sustainability of nest stands. Most have a current utilization standard for herbaceous vegetation which is less than 45 percent, indicating that current use standards should maintain or move towards the desired ecological condition for aspen and the adjacent riparian areas.

Aspen stands that are not moving toward vegetation management objectives and show poor or no regeneration also continue in this current trend. The effects of continuing with current management could impact the smaller stands by reducing or eliminating regeneration which may result in a slow disappearance of these stands. In the long term, as aspen stands continue to decline without adequate regeneration, the risk of losing small aspen clones across the landscape increases, which results in a loss of plant community diversity. This loss contributes to a decline in species diversity and a reduction in goshawk management options. This is only expected to occur in those stands with greater than 45 percent herbaceous use which comprise about 8 percent of available goshawk nesting habitat. This unsatisfactory habitat may never move toward satisfactory under this alternative.

Cumulative Effects

Fuelwood harvest and recreational uses within aspen stands can have a direct impact on northern goshawks by disturbing nesting or foraging birds, causing damage to nest trees, or displacing goshawks from important habitats. Inappropriate or illegal woodcutting techniques and vehicle use may also damage aspen stands, which would impact northern goshawks habitats. These impacts are cumulative to impacts that livestock grazing may have on the northern goshawk and its habitats. Livestock grazing affects the health of some aspen stands within the project area. The cumulative effects of woodcutting, recreational uses, and livestock grazing are believed to have noticeable adverse effects on less than 20 percent of the total aspen stands within the cumulative effects area.

Because woodcutting (less than 60 cords harvested per year) and recreation are generally small programs on the District and livestock grazing would generally not result in considerable disturbance to the northern goshawk, the potential cumulative effects as a result of disturbance would be minimal and generally occurs near roads and disbursed campsites.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and the spread noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce these negative effects to wildlife.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

With Alternative 2, proper use criteria would be based on ecological condition and management changes would occur to correct the problems and move conditions toward upward trends. Goshawk habitat would improve over time with Alternative 2, because allowable use within aspen stands that are not functioning as desired would be reduced. Therefore, the effects from grazing would not result in a decline in goshawk habitat distribution, availability, or result in a decline in goshawk productivity. With this alternative, aspen regeneration is expected to survive, flourish, and result in maintaining stands across the landscape; there should be no net loss of aspen acres with this alternative.

With management actions under Alternative 2, goshawk foraging habitat currently in unsatisfactory condition should move toward satisfactory foraging habitat in an accelerated timeframe from Alternative 1, resulting in upward trends in foraging habitat. It is anticipated that some nesting habitat could develop from some of the suitable aspen foraging habitat with development of larger tree sizes on better sites. Increased residual grasses/forbs/shrubs remaining after grazing should enhance prey species habitat, including both mammals and birds. An evaluation of whether aspen vegetation conditions are moving towards satisfactory conditions with implementation of Alternative 2 would be accomplished with long-term effectiveness monitoring as identified in Chapter 2.

Implementation of Alternative 2 would result in maintaining existing nesting habitat. Recruiting nest habitat over time could result in a slight increase in goshawk population across the project area and the Humboldt-Toiyabe National Forest.

Cumulative Effects

Due to the reduced direct and indirect effects, the cumulative effects associated with Alternative 2 would be less than those disclosed under Alternative 1.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3 it is expected that habitat conditions important for goshawk nesting and foraging habitat would recover, probably in a shorter time frame than with either Alternatives 1 or 2. However, removing range improvements, especially water developments, could reduce the localized carrying capacity for prey species important for goshawk.

In the short term, Alternative 1 would not move conditions forward that would allow for recruitment of satisfactory habitat from unsatisfactory capable habitat. No grazing would achieve similar results as Alternative 2, but would cumulatively increase residual vegetation over time instead of that which is recruited under Alternative 2, thereby enhancing prey species habitat. This could result in a slight increase in goshawk population across the project area.

Cumulative Effects

Under this alternative, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects disclosed under Alternative 1 within the project area.

Western Big-Eared Bat and Spotted Bat

AFFECTED ENVIRONMENT

The distribution of the western big-eared bat (*Corynorhinus townsendii)* ranges from western Canada, the western United States to southern Mexico, and a few isolated populations in the eastern United States. They are considered locally common in the western United States. Current Nevada records indicate this species is distributed between 688 - 11,500 feet primarily in pinyon, juniper, mahogany, white fir, blackbrush, sagebrush, salt desert scrub, grassland, agricultural, and urban habitats (Bradley et al. 2006). Maternity and hibernation habitats are similar to roosting sites. Potentially suitable roosting and maternity habitat may be present in caves, rock crevices, old buildings, and abandoned mines. These bats do not migrate long distances and have demonstrated strong roost site fidelity (Kunz and Martin 1982). Hibernation sites in caves are often near entrances in well ventilated areas. They hibernate in clusters of a few to more than 100 individuals.

The spotted bat (*Euderma maculatum*) occurs in a wide range of habitats in the western regions of the continent, most often in rough, rocky, semi-arid, and arid terrain, varying from ponderosa pine forest to scrub country and open desert. The distribution ranges from south central British Columbia to southern Mexico. Current Nevada records indicate this species is distributed between 1,770-7,000 feet (Bradley et al. 2006). Often this bat is associated with the sagebrush and the shrub-steppe ecosystem at low elevations. It is extremely rare wherever it occurs and is considered one of the rarest bats in North America. Due to its rarity, habitat relationships are poorly defined. In most cases they seem to prefer crevices in rocks and cliffs for roosting and maternity sites. Spotted bats are usually solitary and roost alone in steep cliffs or rock faces. They are also known to roost under the loose bark and in cracks of large old trees and snags. Spotted bats hibernate during the winter and emerge in spring, generally March or April, depending upon daytime temperatures during those months (Watkins 1977).

Spotted bats have only been detected at twelve locations throughout Nevada. Their distribution is patchy and linked directly to cliff roosting habitats (Bradley et al. 2006). Spotted bats have not been documented on the District. Suitable roosting and maternity habitat maybe present within rocky cliffs of the project area. Suitable foraging habitats occur throughout the project area with concentrated use occurring at springs, seeps, and riparian areas.

Foraging habitat for both western big-eared bat and spotted bat occurs in forest openings, pinyon-juniper woodlands, riverine/riparian habitats associated with small to mid-sized streams in narrow canyons, wetlands, meadows, and old agricultural fields (USDA 1991a; Wai-ping and Fenton 1989). Western big-eared bats telemetry studies in Nevada have revealed over 95 percent of foraging activity to be concentrated in open forest habitats of pinyon-juniper, mahogany, white fir, aspen, and cottonwood (Bradley 2000). An acoustic survey in the summer of 2006 recorded a call from a western big-eared bat near a water trough just north of the Martin Basin Allotment. Because of their range, it is likely western big-eared bats forage throughout the project area. Potentially suitable foraging habitats would likely include springs, seeps, and riparian areas.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, livestock grazing would primarily affect the quality of foraging habitat for the western big-eared and spotted bats within riparian areas, wet meadows, and springs that are not moving toward Forest Plan vegetation management objectives. Riparian areas that are not moving toward management objectives within bat foraging habitat would continue in this trend. Past grazing practices and current higher utilization standards, particularly in springs and meadows, have resulted in a reduction of the quantity and quality of forbs available for attracting insect prey for foraging bats. Livestock grazing and trampling have reduced vegetation in these areas. Utilization standards on many of these sites is as high as 65 percent which can result in drying of the meadows and spring which may impact the quality of foraging habitats. This condition is unfavorable for food and cover needed by many nocturnal insect species that are forage for bats.

Within the project area, the potential impacts of this alternative on maternity sites and hibernacula are limited. Roosting and maternity sites occur in steep cliffs, rock crevices, caves, mine shafts, snags, or under loose bark in trees. Livestock generally are not present in these areas. The limited impact of livestock grazing would be to foraging females who do not fly far from the roost when nursing. If livestock have impacted the quality or quantity of vegetation or riparian areas near roost sites, there is a potential to affect the abundance of insect prey in the area or the

quality of water available for drinking. Livestock are not present on the allotments during the time of the year bats hibernate and would not impact these areas.

This alternative would impact western big-eared and spotted bats and their habitats because livestock are present in the area and disturbance is still occurring. Under this alternative, long-term western big-eared and spotted bat populations and their habitat should remain relatively stable within the project area.

Cumulative Effects

Recreational visitors and mining related activities such as road construction and mineral exploration may disturb bat habitat in the riparian or meadow systems that is critical for bat foraging such as camping near those sites or road construction through meadow systems. This disturbance is cumulative to disturbance which may occur as a result of cattle grazing and associated activities. Bats generally forage at night while most of the activities described above occur during the day. Recreational activities generally occur near roads, trails, and developed sites. Although recreational activities may disturb bats, it is generally localized and represents only a small portion of the habitats available. Current mineral exploration activities are focused around Buckskin Mountain and only occur during a few months out of the year. The potential cumulative impacts associated with recreational, mining, and grazing activities are generally localized in nature and often occur during the day when bats are not actively foraging. The potential effects would be minimal and limited to individual bats.

Private land management and development, mining, and recreational activities such as dispersed camping may alter vegetative communities that provide potential foraging habitats for bat species. These effects are cumulative to the impacts on vegetation resulting from livestock grazing. The cumulative activities are generally limited in size and are estimated to have directly affected less than 100 acres over the past 10 years. These activities have minimal impacts on these species that have thousands of acres of suitable foraging habitats on the District.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread of noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce negative effects to wildlife.

In 2007, the District implemented a small wetland project on the Martin Basin Allotment. An old stock pond was dredged to provide wetland habitats for birds, amphibians, and other wildlife species. The pond and associated spring were then enclosed within a 5+-acre exclosure to protect the site from livestock grazing impacts. This project provides water and forage supply of concentrated insects for bats. During site visits in 2008, waterfowl, shorebirds, and various other birds were observed using the site and the pond contained thousands of Pacific chorus frog tadpoles.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Livestock grazing under Alternative 2 would primarily affect potential foraging habitat for western big-eared and spotted bats, mainly in riparian areas, wetlands, and springs. Vegetation has been reduced in many riparian and spring/seep areas from livestock grazing and trampling. This condition is unfavorable for food and cover needed by many nocturnal insect species that are forage for bats.

Under this alternative, the proper use criteria applied to most riparian areas (springs/seeps and meadows) would reduce maximum utilization from 65 to 45 percent. In those areas that are not in functioning ecological condition, the utilization would be even lower. This would allow for a more rapid recovery of these important habitats.

In addition to using the Matrices to evaluate the uplands (including aspen stands), riparian areas, wet meadows, and springs, there are a variety of management strategies that could be put into place (see Appendix D) to reduce the impacts of livestock grazing to those areas that are not in desired condition. Utilizing proper use criteria to reduce the impacts to these areas would allow for faster recovery and reduce impacts to important western big-eared and spotted bat foraging habitat, which would result in an upward trend in condition. This would allow livestock use within these habitats while maintaining sufficient vegetation resources to provide forage and cover for bats and their prey.

Within the project area, the potential impacts of this alternative on maternity sites and hibernacula are limited. Roosting and maternity sites occur in steep cliffs, rock crevices, caves, mine shafts, snags, or under loose bark in trees. Livestock generally are not present in these areas. The limited impact of livestock grazing would be to foraging females who do not fly far from the roost when nursing. If livestock have impacted the quality or quantity of vegetation near roost sites or riparian areas near roost sites, there is a potential to affect the abundance of insect prey in the area or the quality of water available for drinking. Livestock are not present on the allotments at the time of the year bats hibernate and therefore would not impact these areas.

Although this alternative would impact western big-eared and spotted bats and their habitats, it is not expected to affect the viability of the species. Under this alternative, long-term western big-eared and spotted bat populations should remain relatively stable or increase within the project area.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The potential cumulative effects related to impacts to vegetative communities used for foraging habitats would be reduced because of lower utilization levels in some communities. The communities with the most notable positive changes as it relates to bat species include springs, meadows, and other riparian areas.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3 riparian areas, aspen stands, and understory vegetation would recover and return to desired conditions at a faster pace than under Alternatives 1 or 2. Under Alternative 3 livestock grazing would not occur, providing long-term protection of foraging habitat, increasing long-term viability, and improving habitat condition. Exclusion of livestock would allow for maximum grass, forb, and flower production that would attract insects within the riparian areas

increasing the prey base for the western big-eared and spotted bats. This situation would allow riparian and wet meadows to recover more quickly, and insect species that the bats feed on would likely increase in numbers.

This alternative is not expected to affect the viability of the species. Under this alternative, long-term western big-eared and spotted bat populations should remain relatively stable or increase within the project area.

Cumulative Effects

Under this alternative, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area. This alternative may, however, result in additional livestock grazing impacts on suitable foraging habitats on private lands in the surrounding valleys. These lands contain wet meadows, productive agricultural lands, and other areas that provide important foraging habitats for bats. Under this alternative, the potential cumulative effects may be displaced from habitats on National Forest System lands to habitats on adjacent private lands.

Flammulated Owl

AFFECTED ENVIRONMENT

The flammulated owl (*Otus flammeolus*) is a tiny owl that feeds on invertebrates and nests in cavities in western forests (McCallum 1994). This species was originally thought to be rare and always associated with coniferous forests. However, it is now believed to be more common, yet secretive, and also utilizes aspen forests. This species is considered a neotropical migratory bird.

The flammulated owl is a small secondary cavity-nesting bird that breeds in montane coniferous and deciduous forests and migrates to southern Mexico and northern Central America in winter. Breeding populations are found from central-southern British Columbia along the western United States to the Sierra Madre and mountain ranges of northern and central Mexico. Flammulated owls feed almost entirely on insects such as moths (*Lepidoptera*), grasshoppers (*Orthoptera*), and beetles (*Coleoptera*), which they obtain from gleaning along vegetation and from the ground (McCallum 1994). Vertebrate prey is rarely found in their diet, but records of opportunistic feeding on rodents and bats does exist (Oleyar et al. 2003).

On the Santa Rosa Ranger District potentially suitable habitat is limited to larger, mature aspen stands. In 1992, a single flammulated owl was recorded near Lye Creek Campground (Mika 2006). No other sightings have been reported, and it is unknown if the one sighting was of a resident bird or one migrating north to population strongholds in Oregon and western Idaho. This site was re-surveyed in 2005 and no flammulated owls were detected (Mika 2006). The Round Corral area was surveyed in 2005 and no flammulated owls were detected (Mika 2006). The aspen stands in Round Corral were found to have too small of trees, and lacked large trees with cavities needed by flammulated owls. The north and south forks of Cabin Creek were surveyed in 2006. One flammulated owl responded during the survey. An attempt to capture and band the bird was unsuccessful. Deep Creek was also surveyed in 2006, but there were no flammulated owls detected during the survey. Both of the areas surveyed in 2006 offer only isolated patches of suitable habitat for flammulated owls (Mika 2007). Although flammulated owls have been detected in these small, isolated patches of aspen near Cabin Creek and Lye Creek, potentially suitable habitats are considered very limited on the Santa Rosa Ranger District. This is primarily due to a lack of forested habitats, in particular the absence of coniferous forests and large aspen with cavities. The potentially suitable flammulated owl nesting and foraging habitats are displayed in Table 21 for the project area.

The Santa Rosa Ranger District may only be used by flammulated owls during migration or as staging grounds for non-breeding adults. At this time, no flammulated owls have been documented nesting within the project area (Mika 2006). The vegetation condition for aspen is functioning and in an upward trend across most of the project area; therefore the potentially suitable flammulated owl habitat in the project area is considered stable.

Table 21. Flammulated Owl Habitat by Allotment.

ALLOTMENT	POTENTIAL NESTING HABITAT (acres)	PERCENTAGE OF ALLOTMENT
Bradshaw	9	.3%
Buffalo	2,974	14%
Buttermilk	2,748	8%
Granite Peak	3,100	8%
Indian	341	2%
Martin Basin	1,219	4%
Rebel Creek	3,145	20%
West Side Flat Creek	1,218	6%
TOTAL	14,754	

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

The project area has only limited habitat for this species. Only two birds have been identified on the District and no nests were identified. It appears that flammulated owls may only use the area when migrating to more important habitats in Oregon and Idaho. If the species does use the project area during the spring and summer season, it is likely that only a few individuals would be present.

Livestock grazing under Alternative 1 would primarily affect the quality and quantity of foraging habitat for flammulated owls within riparian areas, wet meadows, and springs that are not moving toward Forest Plan vegetation management objectives. Riparian areas that are stable or not moving toward management objectives within owl foraging habitat would continue in this trend under this alternative. Past grazing practices and current utilization standards, particularly in springs and meadows, have resulted in a reduction of the quantity and quality of forbs available for attracting insect prey for foraging owls. Vegetation in these areas has been reduced by livestock grazing and trampling. Utilization standards on many of these sites is as high as 65 percent, which can result in drying of the meadows and springs, which may impact the quality of foraging habitats. This condition is unfavorable for food and cover needed by many insect species that are forage for owls.

Livestock grazing under this alternative may result in impacts to the quality of nesting and foraging habitats for flammulated owls within aspen communities. Under this alternative, aspen stands that are not moving toward Forest Plan vegetation management objectives and are in low seral stages would continue in their current trend. Under this alternative there is potential for greater impacts to aspen regeneration, which could affect the long-term potential of these stands to provide nesting or additional foraging habitat for the flammulated owl. Currently, the majority

of the aspen stands are managed similar to the adjacent uplands. Allowable utilization is 65 percent of the herbaceous vegetation. There are no browsing limits except on the upland brush species, which is 35 to 50 percent of the current year's growth. Aspen located along streams has an allowable use limit of 35 percent of the current year growth. Allowing 65 percent utilization on the understory vegetation may result in browsing on saplings and seedlings. Because of this, the periphery of the larger aspen stands can have a reduced age class representation. Many of the smaller stands at lower elevation are showing no regeneration. This could result in greater impacts to the understory vegetation and affect the potential prey base for the owl.

Although this alternative would impact flammulated owls and their habitats, it is not expected to affect the viability of the species within Nevada or across the species range. Under this alternative, long-term flammulated owl populations should remain relatively stable within the project area.

Cumulative Effects

Woodcutting and recreational uses in aspen stands can have a direct impact on flammulated owls by disturbing nesting or foraging birds, causing damage to nest trees or displacing birds from important habitats. These impacts are cumulative to impacts that livestock grazing may have on the flammulated owl and its habitats.

Woodcutting (less than 60 cords harvested per year) and recreation are generally small programs on the District and livestock grazing would generally not result in considerable disturbance to the owls. The potential cumulative effects as a result of disturbance would be minimal and generally located near roads and dispersed campsites.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread of noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce negative effects to wildlife.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

The project area has only limited habitat for this species. Only two birds have been identified on the District and no nests were identified. Therefore, it appears that flammulated owls may only use the area when migrating to more important habitats in Oregon and Idaho. If the species does use the project area during the spring and summer season, it is likely that only a few individuals would be present.

Livestock grazing under Alternative 2 has the potential to affect foraging habitats for flammulated owls within the project area by reducing the amount food and cover for insect prey species. Under this alternative the utilization standards applied to most riparian areas (springs and meadows) would be reduced from 65 percent to a maximum of 45 percent. In those areas that do not meet desired conditions, the utilization would be even lower. This would allow for a more rapid recovery of these important habitats.

Under this alternative there would be an aspen browse proper use criteria that would ensure long-term protection of aspen stands that are important to flammulated owls for both foraging and nesting habitats. This alternative would limit the amount of browsing by livestock on young aspen to 20 percent of the seedlings or saplings regardless of the functioning level of the stand. This alternative also implements a maximum utilization limit on herbaceous vegetation within aspen stands. These levels range from 0 to 45 percent. These proper use criteria should allow for sufficient aspen regeneration to maintain stands at a desired functioning level. Those stands that are currently not functioning as desired should move towards functioning as desired. This would improve the long-term potential of these stands to provide nesting and foraging habitat for flammulated owls. Under this alternative, the understory vegetation should also be maintained or improved which would provide adequate cover that prey species need.

After the Matrices have been considered in evaluating the uplands (including aspen stands), riparian areas, wet meadows, and springs, there are a variety of management strategies that could be put into place (see Appendix D) to reduce the impacts of livestock grazing to those areas that are not in desired condition. Utilizing various management strategies to reduce the impacts to these areas would allow for faster recovery and reduce impacts to important flammulated owl habitat, which would result in an upward trend in condition. This would allow livestock use within these habitats while maintaining sufficient vegetation resources to provide forage and cover for flammulated owls and their prey.

Although this alternative would impact flammulated owls and their habitats, it is not expected to affect the viability of the species within Nevada or across the species range. Under this alternative, the limited flammulated owl populations should remain relatively stable within the project area.

Cumulative Effects

Foraging habitat should improve under this alternative so the effects would be lower than Alternative 1, but the cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock grazing would not occur, providing long-term protection of foraging habitat, increasing long-term viability, and improving habitat condition. Riparian areas, aspen stands, and understory vegetation would recover and return to desired conditions at a faster pace than under Alternative 1 or 2. No grazing within the project area would improve aspen stands and ensure regeneration, which in turn would benefit flammulated owl nesting habitats. Exclusion of livestock would allow for maximum grass, forb, and flower production that would attract insects within the riparian areas increasing the prey base for the flammulated owl. This situation would allow riparian and wet meadows to recover more quickly and, therefore insect species that the owls feed on would likely increase in numbers.

This alternative is not expected to affect the viability of the species. Under this alternative, long-term flammulated owl populations should remain relatively stable within the project area.

Cumulative Effects

Under Alternative 3, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area.

Pygmy Rabbit

AFFECTED ENVIRONMENT

The pygmy rabbit (*Brachylagus idahoensis*) is the smallest of North American rabbits. The pygmy rabbit has a discontinuous distribution occurring in Montana, Wyoming, Idaho, Utah, Nevada, California, Oregon, and Washington (USDA Forest Service 2001). There is little information on the current distribution of pygmy rabbits in Nevada.

Pygmy rabbits are found primarily on plains dominated by big sagebrush and on alluvial fans where plants occur in tall, dense clumps (Green and Flinders 1980a). The hiding/cover attribute of woody vegetation (height) and the herbaceous component is perhaps the most critical habitat element for this species (Green and Flinders 1980a). Because they would seldom venture even a short distance from suitable cover, dense stands of big sagebrush along streams, roads, fences, and ditches may be the avenues of dispersal (Green and Flinders 1980a). Fragmentation and loss of sagebrush habitat is a major concern because pygmy rabbits are suspected of being reluctant or unable to cross open areas to disperse (Weiss and Verts 1984).

The pygmy rabbit is dependent upon dense stands of big sagebrush for foraging and breeding habitat. Big sagebrush is their primary food source and constitutes up to 97 to 99 percent of their diet in the winter (White et al. 1982). During the summer, grasses become an important part of the diet utilizing 30 to 40 percent (Green and Flinders 1980b). Within these stands of dense sagebrush, pygmy rabbits select sites that have the greatest cover densities in which to dig their burrows. In Idaho and Oregon, pygmy rabbits are found in shrub densities ranging from 30 to 46 percent shrub cover (Green and Flinders 1980a; Weiss and Verts 1984). The elevational range of pygmy rabbits in Nevada extends from 4,494 to over 7,004 feet (Green and Flinders 1980a).

Pygmy rabbits tend to have relatively small home ranges during winter, remaining within roughly 98 feet of their burrows (Gahr 1993, Janson 1946, Orr 1940), although some snow burrows may extend outward up to 328 feet (Bradfield 1975). They have larger home ranges during spring and summer (Gahr 1993, Janson 1946, Orr 1940).

Within the project area, potential habitat for pygmy rabbits occurs and consists of broad sagebrush basins where thick and healthy Wyoming and mountain big sagebrush communities occur adjacent to riparian areas, springs, or other water sources. Old mine sites and/or homesteads may also provide potential habitat. Surveys were conducted by District personnel within the Bradshaw, Buttermilk, and Martin Basin Allotments (Map 5). Active pygmy rabbit burrows were located within all of the areas surveyed. Active burrows were identified and confirmed by fresh droppings and/or actual rabbit sightings. Inactive burrow sites were also located within the areas surveyed. Surveys were not conducted in the Granite Peak, Indian, or West Side Flat Creek Allotments, but personal knowledge of District personnel indicates that potential habitats, based on vegetation, for pygmy rabbit occurs within these allotments. Within the project area, incidental sightings of pygmy rabbits have occurred, so they may be more widespread in their distribution than originally thought. It is unlikely that pygmy rabbits occur in the Buffalo or Rebel Creek Allotments because of the steepness and rockiness of the area. The higher elevation and lack of adequate levels of vegetation also make conditions less favorable for pygmy rabbits.

Based on Green and Flinders (1980a) and consultation with NDOW, suitable burrowing habitat for pygmy rabbits within the project area was estimated based on the following parameters: mountain and Wyoming big sagebrush stands, which occur at elevations of 6,000 to 8,000 feet, with slope less than 20 percent (Table 22). There are approximately 7,758 acres of capable habitat with the majority occurring in Bradshaw, Buttermilk, Granite Peak, Indian, and Martin Basin Allotments. Buffalo, Rebel Creek, and West Side Flat Creek Allotments have very little

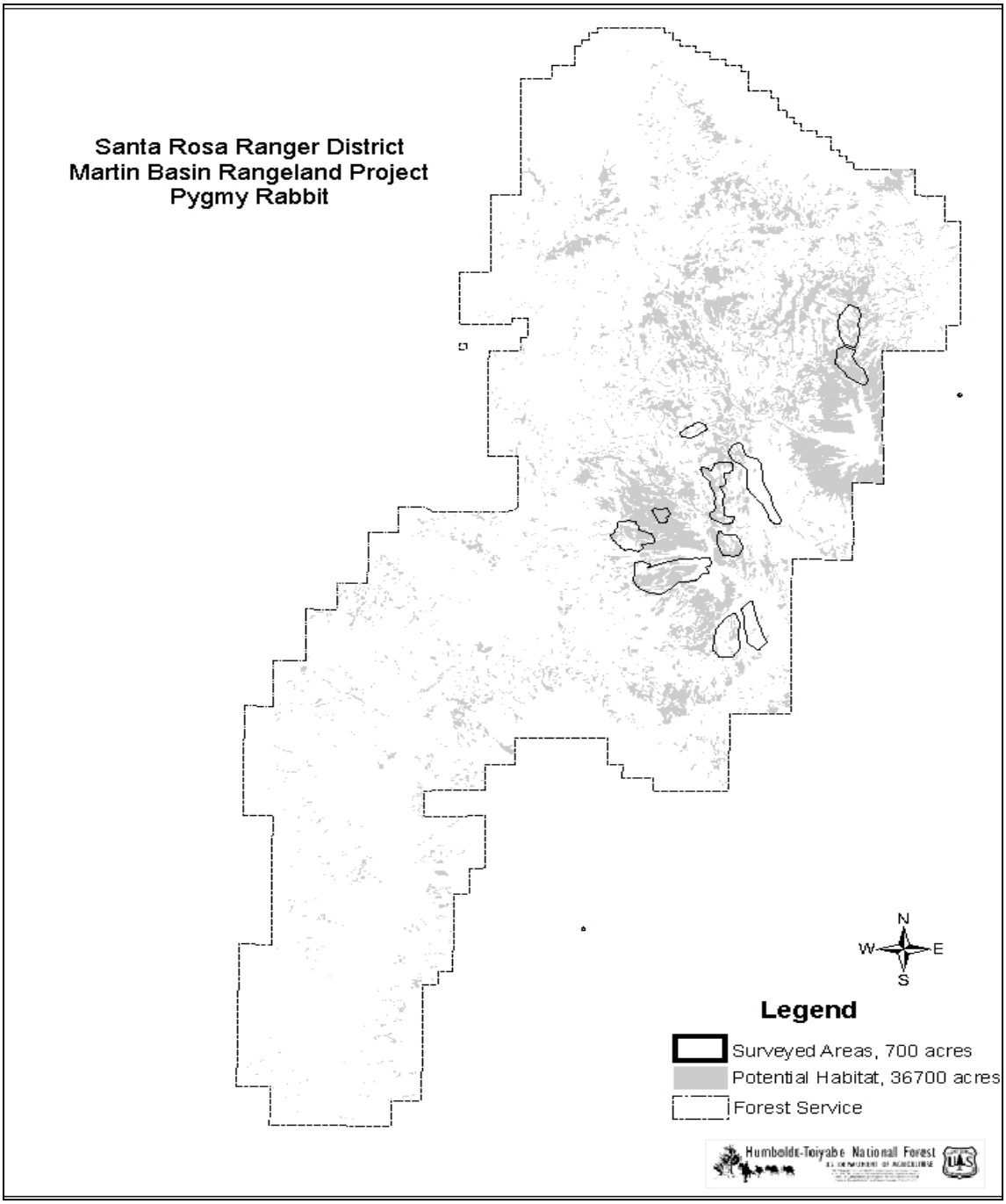
suitable habitat as a majority of those allotments are extremely rocky with steeper ground making them unsuitable for pygmy rabbits. Approximately 36,700 acres of suitable habitat are found on the Santa Rosa Ranger District. Only 700 acres of that habitat has been surveyed for pygmy rabbits. Most of the area surveyed is within the project area.

Wyoming and mountain big sagebrush communities are functioning and in an upward trend across most of the project area, therefore pygmy rabbit habitat in the project area is considered stable.

Table 22. Pygmy Rabbit Habitat within the Project Area by Allotment.

ALLOTMENT	CAPABLE HABITAT (acres)	PERCENTAGE OF ALLOTMENT
Bradshaw	297	9%
Buffalo	71	.3%
Buttermilk	1,386	4%
Granite Peak	1,696	4%
Indian	3,615	20%
Martin Basin	645	2%
Rebel Creek	48	.3%
West Side Flat Creek	0	0%
TOTAL	7,758	

Map 5. Potential Pygmy Rabbit Habitat and Surveyed Areas within the Project Area.



ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

The influence of cattle grazing on pygmy rabbit habitat is not well understood. It has been speculated that the preference of cattle for grasses might result in competition during the spring and summer when pygmy rabbits preferentially select grasses (Green 1978; Washington Department of Fish and Wildlife [WDFW] 1995). The effects do depend on a variety of factors including timing and intensity of grazing, stocking densities, locations of water or salt, and other factors that would concentrate cattle use (WDFW 1995). In some cases, grazing can actually increase cover of sagebrush, by reducing the more palatable herbaceous species, therefore allowing shrubs to flourish giving the pygmy rabbit increased protection (Stevens 1984; WDFW 1995). Livestock trampling sagebrush plants and opening up the understory can also rendered habitat unsuitable for pygmy rabbits. Broken shrubs result in open canopy conditions, which reduces food and shelter for pygmy rabbits (WDFW 1995).

In addition, pygmy rabbits burrow in the relatively loose soils associated with big sagebrush communities. Livestock often walk through these burrow complexes and crush the burrows (Roberts 2003). Since the pygmy rabbit is a sagebrush obligate, the loss of habitat is probably the most significant factor contributing to pygmy rabbit population declines. Fragmentation of sagebrush communities also poses a threat to populations of pygmy rabbits (Weiss and Verts 1984), due to their poor dispersal potential. The protection of sagebrush, particularly on floodplains and where high water tables allow growth of tall, dense stands, is a vital attribute to the survival of pygmy rabbits (Flath 1994).

Loss of habitat due to heavy grazing is a major concern for pygmy rabbits. Suitable and potential habitat is present throughout the project area. Suitable home range includes all areas of mountain big and Wyoming sagebrush that are in close proximity to springs, seeps, and riparian areas. Vegetation has been reduced and altered in many seep/spring areas from livestock grazing and trampling. The loss of quantity and quality of understory vegetation in many potential habitats, which are not moving toward Forest Plan vegetation management objectives, may impact the pygmy rabbit. Springs and meadows that are not moving toward management objectives within pygmy rabbit habitat would continue in this trend. Past grazing practices and current higher utilization standards, particularly in springs and meadows, has resulted in a reduction of the quantity and quality of forbs available for pygmy rabbits. Under Alternative 1, the utilization standard around springs and many meadows would be 65 percent. Livestock use above 65 percent in these areas can result in drying of the meadows and springs which may impact the quality of foraging habitat. This condition is unfavorable for food and cover needed by pygmy rabbits. Cattle would concentrate in these areas resulting in impacts to potential habitats.

Localized and concentrated use by livestock at sites near water sources and salting locations could affect pygmy rabbit burrows. There is also the potential for burrows to be damaged or destroyed by livestock trampling.

Cumulative Effects

Improperly placed water developments may impact springs and meadows and water troughs can concentrate cattle in areas that may impact important pygmy rabbit habitats. Recreational activities, such as motor vehicle use and dispersed camping, can have limited effects upon potential habitat for pygmy rabbits by altering or damaging vegetation resources that are important to the species. Wildfires, the Buttermilk prescribed burn, and mechanical treatment projects in the area have also altered vegetation communities that are used by pygmy rabbits.

These impacts are cumulative to grazing impacts which include alteration of understory vegetation components and damage to mature sagebrush stands, which causes a decrease in canopy closure.

Recreational activities in the area are light and generally impact very few acres. The cumulative effects resulting from the Buttermilk prescribed burn are also limited. Although the prescribed burn treated approximately 2,100 acres, it is estimated that only a small portion of that area provided potential habitats for pygmy rabbits due to vegetation types, elevation, soils, and other factors. Approximately 500 acres of potentially suitable habitat was affected by the Buttermilk mechanical treatments. Wildfires within the South Fork of the Quinn River also resulted in long-term impacts to several thousand acres of pygmy rabbit habitats.

Wildfires result in the long-term loss of habitats. Other cumulative activities such as recreation, prescribed burns, mechanical treatments, and livestock grazing can alter habitats and reduce the quality of those habitats; however, these activities generally do not result in the loss of those habitats. Tens of thousands of acres of suitable habitats occur within the cumulative effects area in locations that have not been treated, burned, or adversely impacted as a result of concentration of livestock.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread of noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce negative effects to wildlife.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Loss of habitat due to heavy grazing is a major concern for pygmy rabbits. Suitable and potential habitat is present throughout the project area. Suitable home range includes all areas of mountain big and Wyoming sagebrush that are in close proximity to springs, seeps, and riparian areas. Livestock grazing and trampling has reduced vegetation and altered many seep/spring areas. The loss of quantity and quality of understory vegetation in many potential habitats, which are not moving toward Forest Plan vegetation management objectives, may impact the pygmy rabbit. Springs and meadows that are not moving toward management objectives within pygmy rabbit habitat would continue in this trend. Past grazing practices and current higher utilization standards, particularly in springs and meadows, has resulted in a reduction of the quantity and quality of forbs available for pygmy rabbits. Under this alternative, the proper use criteria around springs and many meadows would be 45 percent utilization. Heavy livestock use in these areas can result in drying of the meadows and springs which may impact the quality of foraging habitat. This condition is unfavorable for food and cover needed by pygmy rabbits. Cattle concentrate in these areas resulting in impacts to potential habitats.

Localized and concentrated use by livestock at sites near water sources and salting locations could affect pygmy rabbit burrows. There is also the potential for burrows to be damaged or destroyed by livestock trampling.

Under Alternative 2, the proper use criteria applied to most springs and meadows would be reduced from 65 percent utilization to a maximum of 45 percent. The utilization would be lower if these habitats are not in desired condition, which would result in a faster recovery of these habitats.

Past grazing practices and current utilization standards in some areas, particularly in springs and meadows, have resulted in a reduction of the quantity and quality of forbs available for pygmy rabbits, and reduced the amount of cover available to escape from predators. Localized and concentrated use by livestock at sites near water sources and salting locations could affect pygmy rabbit burrows. There is also the potential for burrows to be damaged or destroyed by livestock trampling.

After the Matrices have been considered in evaluating the uplands, riparian areas, wet meadows, and springs, there are a variety of management strategies that could be put into place (see Appendix D) to reduce the impacts of livestock grazing to those areas that are not in desired condition. Utilizing various management strategies to reduce the impacts to these areas would allow for faster recovery and reduce impacts to important pygmy rabbit habitat. This would allow livestock use within these habitats while maintaining sufficient vegetation resources to provide forage and cover for pygmy rabbits. Under this alternative, pygmy rabbit populations are expected to remain relatively stable or increase within the project area.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The potential cumulative effects related to impacts to vegetative communities used by pygmy rabbits would be reduced as a result of lower proper use criteria near some vegetative communities. The communities with the most notable changes as it relates to pygmy rabbits would include mature sagebrush stands near springs, meadows, and other riparian areas.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3 springs, seeps and meadows would recover and return to desired conditions at a faster pace than under Alternative 1 or 2. Under Alternative 3 livestock grazing would not occur, providing long-term protection of foraging habitat, increasing long-term viability, and improving habitat condition. Shrub density providing hiding cover from predators would be the greatest under this alternative. The abundance of grass and forbs species would increase and provide more forage for this species during the spring and summer.

Direct impacts from trampling of sagebrush cover and burrows, as well as indirect impacts associated with livestock use and associated activities, exist but would be reduced over time. Additionally, springs and wet meadows that have been affected by water developments or salting stations would improve. Livestock congregation areas would also be eliminated over time.

This alternative is not expected to affect the viability of the species. Under this alternative pygmy rabbit populations should remain relatively stable or increase within the project area.

Cumulative Effects

Under this alternative, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area. However, this alternative may result in additional livestock grazing impacts to mature sagebrush communities on private lands in the surrounding valleys. There may be increased pressure to treat these sagebrush communities to provide for increased grazing capacity for livestock displaced from National Forest System lands. These treatments may alter habitats for pygmy

rabbits on private lands. Under this alternative, the potential cumulative effects may be displaced from habitats on National Forest System lands to habitats on adjacent private lands.

When livestock grazing is eliminated from the project area, there would be an increase in residual vegetation. With this increase in fine fuels there may be some increase in frequency of wildfires. The potential increased frequency of wildfire would be minimal at higher elevations; however, lower elevation sagebrush communities may see increased cumulative effects associated with wildfire, in particular where cheatgrass is a serious problem. This alternative may result in an increased loss of lower elevation sagebrush communities which are important to pygmy rabbits.

Management Indicator Species

Project-level effects on Management Indicator Species (MIS) habitat are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). This involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area. This analysis is documented in the *Martin Basin Rangeland Management Project Management Indicator Species and Rangeland Capability Report (2008).*

All of the management indicator species have been carried forward in analysis. These species (trout including Lahontan cutthroat trout, mule deer, sage grouse, and northern goshawk) are either present within the project area or their habitats are present and have been identified as potentially affected by livestock grazing activities described in the proposed action (USDA Forest Service, MB MIS/Range Capability Report 2008). It has been determined that direct, indirect and cumulative effects are possible, primarily due to the effects of livestock presence and vegetation removal through grazing and trampling in combination with the past, present, and future actions.

Lahontan Cutthroat Trout

Information regarding LCT trout populations and habitat can be found above in the Threatened and Endangered Species section as well as in the 2008 Martin Basin MIS Report (USDA Forest Service, MB MIS/Rangeland Capability Report 2008). Please refer to the Lahontan cutthroat trout under Threatened and Endangered Species for effects to Lahontan cutthroat trout.

Trout

AFFECTED ENVIRONMENT

Throughout the Forest, trout are stocked in lakes, rivers, and creeks. Some areas that have stocked trout are considered “put” and “take” recreational fisheries that do not have a self-reproducing population. Trout (excluding LCT), within the project area are non-native rainbow trout, brown trout, and brook trout. The minimum viable level for all trout species is 2,470 pounds for the entire the Humboldt-Toiyabe National Forest. This amount was surpassed within the project area where between 2002 and 2006, 7,997 pounds of trout were stocked (Table 23).

Table 23. Pounds of Trout Stocked in Streams within Project Area Allotments.

ALLOTMENT	STREAM	SPECIES	POUNDS STOCKED
Granite Peak	Solid Silver Creek	Rainbow Trout	372
Indian	East Fork Quinn River	Rainbow Trout	617
		Brown Trout	995
Martin Basin	North Fork Little Humboldt	Rainbow Trout	990
		Brown Trout	235
Martin Basin, Bradshaw, Buttermilk	Road Creek	Rainbow Trout	372
Martin Basin, Cabin Creek	Cabin Creek	Rainbow Trout	920
		Brown Trout	60
		Brook Trout	120
	Dutch John	Rainbow Trout	555
		Brown Trout	95
		Brook Trout	120
	Lye Creek	Rainbow Trout	365
	Martin Creek	Rainbow Trout	1,230
		Brown Trout	817
		Brook	90
	Siard Creek	Brown Trout	44
Total Pounds Stocked			**7,997**

Many streams within the project area possess bank stability attributes (soil and vegetation stability) that are at optimum conditions (Table 24). However, under Forest Plan direction, streambank stability may fall below 80 percent on streams with non-native trout (rainbow, brook, and brown trout). Within the project area, approximately 246 miles of habitat are considered capable for trout of which the majority is considered to be in satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008).

Optimum bank soil stability is considered to be excellent with greater than 80 percent plant density, 65 percent of the upper bank comprised of large angular boulders, and less than 25 percent of the bank under stress or eroding. Bank vegetation stability is a parameter that gives an indication of streambank condition, which determines how well a streambank will withstand erosion during high stream flows. A stable bank will be covered by vigorous vegetation and/or have rock material, which bind streambank soils.

Indicators that will be analyzed are populations and bank stability. These indicators are discussed below along with other stream attribute measurements that are closely associated with stable banks.

Table 24. Condition of Trout Capable Streams within the Project Area.

ALLOTMENT	STREAM	PERCENT BANK SOIL STABILITY[1]	PERCENT BANK VEGETATION STABILITY[2]
Buffalo	Andorno Creek (2001)	86.5	91.0
	Falls Canyon Creek (1998)	81.6	80.2
	McConnell Creek (2006)	69.5	75.9
Buttermilk	Round Corral Creek (2006)	71.0	75.3
Granite Peak	Indian Creek (2000)	72.9	74.3
	Mullinex Creek (2000)	77.5	77.3
	South Fork Indian Creek (2000) [3]	72.9	91.3
Indian	East Fork Quinn River (1997)	65.6	59.3
	Jakes Creek (1987)	63.8	60.8
	South Fork Quinn River	59.0	
Martin Basin	Long Canyon Creek (1998)	65.4	73.2
	North Fork Little Humboldt River (1998)	72.5	68.3
Martin Basin, Bradshaw, Buttermilk	Alkali Creek (2001)	74.2	76.3
	Deep Creek (2000)	85.4	86.1
	Road Creek (2000)	80.3	86.8
Martin Basin, Cabin Creek	Cabin Creek (2003)	76.4	76.4
	Lye Creek (2000)	87.1	93.2
	Main Fork Dutch John Creek (2000)	82.5	88.9
	Martin Creek (2001)		79.7
	Middle Fork Dutch John Creek (2000)	82.9	97.1
	North Fork Dutch John Creek (2000)	84.0	100.0
	North Fork Cabin Creek (1998)	49.8	55.7
	Siard Creek(2006)	57.5	62.5
Rebel Creek	Rebel Creek (1998)	91.3	91.8
	Rock Creek (2006)	75.0	75.0
West Side Flat Creek	Three Mile Creek (2002)[3]	61.8	65.2
	Flat Creek (1999)	77.0	82.2
	South Fork Flat Creek (1997)	61.3	63.2

[1]Optimum considered to be excellent with >80% plant density, 65% of upper bank material large angular boulders, <25% of bank under stress or eroding. (Good=70-89%; Excellent=90-100%)
[2]Optimum is >80% of streambanks covered by vegetation in vigorous condition or by boulders and rubble. (Good=70-89%; Excellent=90-100%)
[3]South Fork Indian Creek and Three Mile Creek were assessed in 2006 and found to be in satisfactory condition (US Forest Service 2006).

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

The Forest Plan provides direction for the amount of pounds of trout to be present within streams throughout the Forest. Trout stocking levels (or the amount of pounds stocked) by NDOW are not expected to change under any alternative.

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, streams occupied by non-native trout can be classified as Category 3-4 riparian areas. The desired conditions for Category 3-4 riparian areas are as follows:

- Potential key woody species are present, but intermingled with and being replaced by secondary woody species.
- Potential key herbaceous are present and reproducing. Herbaceous cover may be high, but that of key species is 45 to 69 percent of estimated potential.
- Soil productivity has been reduced as evidenced by an 11-19 percent reduction in macro-pore space from estimated potential.
- Streambank stability may fall below 80 percent, but is determined sufficient to protect associated resource values.
- Fish production is 45-69 percent of estimated potential.

Current management in Category 3-4 riparian areas allows streambank stability to drop below 80 percent of potential. This less restrictive direction allows for some degradation of fish habitats. Under current management, unstable banks may lead to undesirable impacts to water quality, reduction in the quality of important habitat components, and maintenance of trout populations that are well below estimated potential.

Cumulative Effects

Cumulatively, livestock grazing is the most widespread activity with the longest duration in the area, starting the in late 1800s. Impacts to the landscape, as noted previously, have been extensive, and impacts to streams and riparian areas are particularly well documented.

Other activities that have cumulatively affected stream habitats, and fisheries within the project area and at the watershed scale outside of the project area include recreation, road construction and maintenance, mining, water diversion and development, and the spread of noxious weeds.

Recreation and dispersed camping alongside roads in riparian areas have also contributed to stream impacts by reducing vegetation and trampling streambanks. Use of OHVs has increased the number of new roads in the area and has allowed more access along streams which also leads to unstable streambanks.

Roads are found along side and/or crossing many streams on both public and private land. Roads can impact watersheds in several ways including: alteration of channel morphology, alteration of runoff regimes, increase of fine sediment levels in streams, reduced riparian vegetation and cover, and confinement of channel (particularly when roads are placed directly next to streams on adjacent floodplains). Where roads intersect streams, culverts, or bridges can create migration barriers or completely block fish movement. Maintenance of roads continually inputs more fine sediment into the watercourse.

Overall, the Travel Management Project on the District reduced the amount of unauthorized motorized use in trout streams. The project reduced the amount of unauthorized roads within 300

feet of perennial streams and 150 miles of intermittent streams. The project also reduced the number unauthorized crossings of perennial and intermittent streams. This reduction of use within riparian areas associated with trout streams will increase streambank stability and lead to a reduction of sedimentation in degraded areas.

The Santa Rosa Range has also been the site for mining activity. Of special concern is the acidic pH and high sulfate levels currently found in the North Fork Little Humboldt River downstream of the Buckskin Mine. No fish or aquatic invertebrates are found in the river until 2 miles downstream of the area.

Agricultural diversions occur on many of the streams in the area, found mostly on privately owned land or on lands administered by the BLM. The diversions depend on a reliable water supply from upstream sources on the Forest. Effects to the water source such as alterations in channel morphology leading to channel incision can cause changes to water retention along the riparian zone. This can amount to less water being available during low flow periods. In some cases, water removal would result in reduced quantity and quality of habitat for trout. Many of the streams in the area do not persist much beyond the point of diversion due to dissipation onto alluvial fans as streams flow off the mountain. Unscreened diversions can also trap fish causing direct mortality.

Some natural processes outside the control of the Forest have contributed to cumulative effects to aquatic resources. These processes include wildfire and drought. The Santa Rosa District is particularly susceptible to wildfire due mainly to existing moisture regimes and conversion of native vegetation species to cheatgrass. Fires tend to spread quickly and burn hotter than in other areas. Extensive wildfires along riparian areas can lead to bare ground along streambanks. Resulting conditions can lead to increased sediment inputs from eroding banks.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Where Alternative 2 varies from Alternative 1 is in areas currently managed as Category 3-4 riparian areas. Depending on the current management system, percent utilization varies from 50 percent under a season long grazing system to 65 percent for a high intensity short duration system. Under Alternative 2, the highest utilization allowed under any grazing system would be 45 percent within riparian areas. There would be reduced utilization of key riparian species, such as aspen, cottonwood, and willow by livestock. Thus, management actions would move conditions within unsatisfactory riparian habitat toward satisfactory conditions by allowing for less utilization of these key riparian species by livestock. With the reduced levels of use on riparian species, there should be an increase in the health, vigor, and productivity of these species, thus increasing the quality and availability of riparian habitat slowly overtime.

A lower utilization level in riparian areas would reduce the amount of time streambanks are subject to livestock use. Within streams occupied by trout species, habitat conditions under Alternative 2 are expected to improve. Fine sediment levels are expected to be lower under Alternative 2 due to improved streambank conditions and riparian vegetation in streams within the project area. Thus, there would be a movement toward meeting desired conditions. This movement toward satisfactory habitat conditions would be accelerated within unsatisfactory stream reaches compared to Alternative 1.

Current stream bank conditions are expected to improve under this alternative in trout habitats. Trout population levels would could to fluctuate over time as currently occurs, however resulting populations would be expected higher than current levels.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. Alternative 2 would reduce cumulative effects to habitats within the project area that are currently occupied by trout species.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock would be removed from each allotment. Stream function would move closer to its nature potential. Over the long-term, existing vegetation is expected to increase in vigor and density, which would trap more sediment and decrease bare ground and erosion. Sedimentation as a result of livestock presence on streambanks would be eliminated. No grazing in areas occupied by trout species would promote clear, clean, and cold streams, with stream substrates that are relatively silt-free. Impacts to important habitat components such as prey availability, cover, spawning gravels, and water temperatures from livestock would be completely eliminated under this alternative.

Current stream bank conditions are expected to improve more under Alternative 3 compared to the other alternatives. Trout population levels would continue to fluctuate over time as currently occurs, however resulting population levels would be expected to be higher under this alternative as compared to other alternatives.

Cumulative Effects

Cumulative effects associated with Alternative 3 would be similar to those disclosed under Alternative 1. No grazing would reduce cumulative effects to habitats within the project area that are currently occupied trout species.

Mule Deer

AFFECTED ENVIRONMENT

Mule deer (*Odocoileus hemionus*) were analyzed as the MIS for multiple vegetation types, with emphasis on early seral shrubland and woodland habitat in the Humboldt Forest Plan. Mule deer usually require several plant communities and use a variety of land and vegetation features for cover and forage (Leckenby et al. 1982). Mule deer occur within the project area the entire year, moving downslope during heavy winters.

Modeling for mule deer capable habitat included using suitable vegetation communities and slope (USDA Forest Service, H-T MIS Report 2008). The following are the vegetation types used for this modeling:

- Riparian community: black cottonwood (MRI) and wet meadow (WTM).
- Aspen: aspen (ASP).
- Conifer: eastside pine (EPN).
- Sagebrush: shadescale (ASC), bitterbrush (BBR), blackbrush (DSC), low sagebrush (LSG), and Great Basin mixed scrub, Great Basin desert mixed scrub, big basin sagebrush, mountain sagebrush (SGB).
- Mountain Brush: alpine grasses and forbs (ADS), annual grasses and forbs (AGS), and Great Basin mixed chaparral transition (MCP).
- Pinyon-juniper: pinyon pine (PJN), Utah juniper (JUN).

Satisfactory foraging habitat for mule deer was determined using on-the-ground knowledge of the mapped capable habitat by District resource personnel. Based on the project area capable habitat,

general percentages were developed for satisfactory condition. Table 25 outlines these percentages of satisfactory and unsatisfactory habitat found within the vegetation communities of the project area.

Table 25. Percentage of Capable Deer Foraging Habitat in Satisfactory Condition.

	ASPEN	RIPARIAN	MOUNTAIN MAHOGANY	SAGEBRUSH	MOUNTAIN BRUSH
Satisfactory Foraging (percentage)	85	78	90	60 (Winter)	60 (Winter)
				85 (Summer)	90 (Summer)
Unsatisfactory Foraging (percentage)	15	22	10	40 (Winter)	40 (Winter)
				15 (Summer)	10 (Summer)

These acres were taken from project level modeling runs (September 2008).

Within the project area, the sagebrush community identified as being in unsatisfactory condition at lower elevation is due to degraded systems from cheatgrass and noxious weed infestations because of recent wildfire activity. Most of this burned habitat is a transitory change and would recover to once again support sagebrush. In the upper mountain big sagebrush community, the unsatisfactory condition is due to extensive stands of mature sagebrush that lack the herbaceous understory vegetation.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, the utilization rates would remain at 65 percent on upland grasses and 50 percent on upland shrub species. This may continue to affect understory vegetation such as the lack of cool season grasses and early spring forbs. Utilization of key shrub species, such as bitterbrush (*Purshia tridentata*), as well as woodland riparian species and aspen, would continue at current trends, resulting in either unchanged conditions or a decrease in the health and productivity of this habitat component. The total amount of deer habitat would not change; habitat quality could stay about the same or decline. Thus, there would be no change in conditions in terms of moving unsatisfactory deer habitat toward satisfactory condition.

Cumulative Effects

Fuelwood harvest can damage aspen stands by limiting the amount of aspen shoots that are available for browse. Mechanical vegetation treatments are a short-term impact on habitat, but because the scope of the treatments are focused and can avoid sensitive areas, they provide accelerated improvements over time. While the acreage of the impacts may be relatively small, mineral exploration is expected to continue. These effects usually include temporary road construction, pad development, and human disturbance. Dispersed recreational activities can alter or affect vegetative communities by impacting aspen stands for camping, OHV use on roads, and human disturbance by displacement of deer. The potential impacts of fuelwood harvest, vegetation treatments, prescribed burns, mineral exploration, and dispersed recreation are generally limited in scope and/or timing and impact only a small percentage of the total available habitats for mule deer. The cumulative effects of these activities when compared to the effects associated livestock grazing are considered minimal.

The cumulative effects resulting from the Buttermilk prescribed burn are also limited. Although the prescribed burn treated approximately 2,100 acres, it was done during the cool spring and created a mosaic pattern which limited the impacts to deer. Approximately 500 acres of potentially suitable habitat was affected by the Buttermilk mechanical treatments. The adverse impacts from these treatments were also limited and the treatments will result in some short-term and long-term benefits to deer.

Wildfires have broad impacts on vegetation. The timing, duration, and intensity of the fire can have long-term effects across the landscape. Wildfires have affected nearly 30,000 acres of mule deer habitat within the northern and western portions of the cumulative effects area over the past 10 years. Many of these habitats are slowly recovering; however, the lowest elevations will generally have long-term impacts associated with cheatgrass invasion. These impacts are cumulative to the effects from livestock grazing which is the most widespread use within the cumulative effects area, and impacts habitats for mule deer by decreasing the availability of important forbs and shrubs, altering vegetation resources within riparian and aspen habitats, and reducing available forage. Adverse effects associated with grazing use is generally associated with areas where livestock concentrate such as springs, meadows, near water developments, along fencelines, and near salting locations. Vegetation communities which have been impacted by wildfires, livestock grazing, and other uses generally provide some degree of habitat for mule deer. However, those habitats may be degraded or of reduced quality. Thousands of acres of vegetative communities occur within the cumulative effects area which have had little to no impacts from the uses and events described above. These vegetative communities provide high quality habitats for mule deer.

Mule deer may also be disturbed or their patterns disrupted by the various activities described above. Disturbance of mule deer by the various uses and activities are localized in nature and generally short term. Individual mule deer may be displaced to adjacent habitats; however, there is rarely a loss of habitat except in the case of wildfire.

Fences associated with livestock grazing activities also pose a risk to mule deer. Fences can pose a barrier to mule deer and can result in entanglement. Fences can result in the loss of individual mule deer within the cumulative effects area.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread of noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce these negative effects to wildlife.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

There would be reduced utilization of key brush species, such as bitterbrush, mountain mahogany, aspen and riparian woodland species by livestock, resulting in more post-grazing residual stems and leaves, increased vigor, and improved growth form. Thus, management actions would move conditions within unsatisfactory deer habitat toward satisfactory conditions. Residual grass/forb cover would be allowed to establish and be available within all vegetation

communities on both summer and winter range. Riparian/meadow habitats would have increased availability and growth. Current years brush growth would be available for deer. With the reduced levels of use on shrubland and woodland species, there should be an increase in the health and productivity of shrubs, thus increasing the quality and availability of foraging habitat for resident deer. Riparian, meadow, sagebrush, and mountain brush vegetation types should improve, moving in a direction towards improving forage quality and increasing the availability and amount of satisfactory habitat.

With implementation of Alternative 2, there would be no change to the amount of large expansion of mature sagebrush. The proposed action would affect one unsatisfactory element within the sagebrush community – lack of understory vegetation. Management actions of changes in utilization levels of grasses/shrubs would move conditions within unsatisfactory sagebrush habitat used by deer, toward satisfactory conditions by allowing for residual understory grass/forb cover to establish and be maintained within sagebrush and all other vegetation communities, as well as making more forage from key shrub species available for deer browse.

An evaluation of whether shrubland and woodland vegetation conditions are moving towards satisfactory conditions with implementation of Alternative 2 would be accomplished with long-term effectiveness monitoring as identified in Chapter 2.

Approximately 60-85 percent of the existing sagebrush and 60-90 percent of the mountain brush types are providing satisfactory mule deer habitat within the project area. With management actions under Alternative 2, unsatisfactory conditions within both brush communities should increase in vegetative availability and quality and thus move toward satisfactory habitat (allowing for residual grass/forb vegetation to establish and be available with reduced utilization on key shrubs) resulting in upward trends in winter foraging habitat. Woodland habitat (riparian species, aspen, and mountain mahogany) should respond similarly across occupied deer ranges.

The direct, indirect, and cumulative effects of Alternative 2 would change with time, the quality of available shrubland and woodland within the Martin Basin Rangeland Project Area, resulting in an upward trend in the amount of satisfactory mule deer habitat. With management actions under the proposed action, capable sagebrush and mountain brush habitat should improve by providing more residual vegetation of potentially higher quality. Better quality and availability could slightly improve carrying capacity resulting in slight upward trends in deer use and deer populations. Without active implementation of a restoration strategy (i.e., mechanical treatment or use of prescribed fire in old sagebrush and mountain brush communities), maximizing efforts to recruit satisfactory habitat for deer would not be accomplished with the proposed action alone.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The potential cumulative effects related to impacts to vegetative communities used by mule deer would be reduced as a result of lower proper use criteria (utilization) in some vegetative communities. The communities with the most notable changes as it relates to mule deer include springs, meadows, and other riparian areas, as well as sagebrush and mountain brush communities adjacent to these riparian areas.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock grazing would not occur in the project area. This would allow understory grasses and shrubs to increase or improve at a faster rate over time. All early spring grass and forb growth would be available as forage for deer. There would be no livestock utilization of key brush species, such as bitterbrush or other woodland species. Thus,

management actions of allowing no grazing would move conditions within unsatisfactory deer habitat toward satisfactory conditions. Residual grass/forb cover would be allowed to establish and be available within all vegetation communities on both summer and winter range. Current year brush growth would be available for deer. With the reduced levels of livestock use on shrubland and woodland species, there should be an increase in the health, vigor, and productivity of shrubs, thus increasing the availability of nutritional forage for deer.

With management actions under this alternative, capable sagebrush and mountain brush habitat should improve by providing more residual vegetation of potentially higher quality. Better quality and availability could slightly improve carrying capacity resulting in slight upward trends in deer use and deer populations.

Cumulative Effects

Under this alternative, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area. However, this alternative may result in additional livestock grazing impacts within meadows and mature sagebrush communities on private lands in the surrounding valleys. There may be increased pressure to treat sagebrush communities to provide for increased grazing capacity for livestock displaced from National Forest System lands. These treatments may alter habitats for mule deer on private lands. Under this alternative, the potential cumulative effects may be displaced from habitats on National Forest System lands to habitats on adjacent private lands.

When livestock grazing is eliminated from the project area there would be an increase in residual vegetation. With this increase in fine fuels there may be some increase in frequency for wildfires. The potential increased frequency for wildfire will be minimal at higher elevations; however, lower elevation sagebrush communities may see increased cumulative effects associated with wildfire, in particular where cheatgrass is a serious problem. This alternative may result in an increased loss of lower elevation sagebrush communities which are important to mule deer.

Greater Sage-grouse

Please refer to the Greater Sage-grouse section under Sensitive Species for existing conditions and effects to Greater Sage-grouse.

Northern Goshawk

Please refer to the Northern Goshawk section under Sensitive Species for existing conditions and effects to northern goshawk.

Other Species of Interest

Neotropical Migratory Birds

AFFECTED ENVIRONMENT

Executive Order (EO) 13186, signed January 10, 2001, lists several responsibilities of federal agencies to protect migratory birds, among them: support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

Additional direction comes from the Memorandum of Understanding (MOU) between USDA Forest Service and USDI Fish and Wildlife Service signed January 17, 2001. The purpose of this

MOU is to strengthen migratory bird conservation through enhanced collaboration between the Forest Service and Fish and Wildlife Service, in coordination with state, tribal, and local governments. The MOU identifies specific activities for bird conservation, pursuant to EO 13186 including: strive to protect, restore, enhance, and manage habitat of migratory birds, and prevent the further loss or degradation of remaining habitats on National Forest System Lands. This includes: a) identifying management practices that impact populations of high priority migratory bird species, including nesting, migration, or over-wintering habitats, on National Forest System Lands, and b) developing alternatives to minimize impacts to birds and important habitats.

Neotropical migratory birds (NTMB) use all habitats within the Santa Rosa Ranger District during the breeding season when cattle are present. Priority species were identified in the Nevada Bird Conservation Plan (Nevada Partners in Flight 1999) and can be found in the project record. Inventories were done in 2002. Some species of interest include Brewer's sparrow (*Spizella breweri*), Cassin's finch (*Carpodacus cassinii*), dusky flycatcher (*Empidonax oberholseri*), green-tailed towhee (*Pipilo chlorurus*), MacGillivray's warbler (*Oporornis tolmiei*), orange-crowned warbler (*Vermivora celata*), sage thrasher (*Oreoscoptes montanus*), spotted towhee (*Pipilo maculatus*), and vesper sparrow (*Pooecetes gramineus*) (Table 26).

Breeding bird surveys were completed in 2006 within the project area. Common species found included those mentioned above as well as many other species. A list of the species found during these surveys can be found in the project record. Because no long-term monitoring has been done on the District, local population trends are unknown.

Table 26. Habitat Types Related to Bird Species.

BIRD SPECIES	ASPEN/ RIPARIAN	SAGEBRUSH SCRUB	SAGEBRUSH STEPPE	MONTANE SHRUBLAND
Brewer's Sparrow		X	X	X
Cassin's Finch	X			X
Dusky Flycatcher	X			X
Green-tailed Towhee	X	X	X	X
MacGillivray's Warbler	X			X
Orange-crowned Warbler	X			
Sage Thrasher		X	X	
Spotted Towhee	X	X	X	X
Vesper Sparrow		X	X	X

Riparian areas, wet meadows, spring areas, aspen, and cottonwood forests are habitats within the District that show considerable alteration from livestock grazing. These habitats are also high priority habitats identified in the Nevada Bird Conservation Plan (Nevada Partners in Flight 1999). The distribution and diversity of birds is highly associated with vegetation structural diversity (MacArthur and MacArthur 1961).

Mountain mahogany habitat is also critically important to a number of breeding bird species and possibly even more important as thermal cover and foraging habitat of Nevada's wintering birds, which includes sage grouse (Nevada Partners in Flight 1999). During breeding season mahogany sites are important to orange-crowned warbler, MacGillivray's warbler, and dusky flycatcher.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Livestock grazing under Alternative 1 would continue to affect species requiring heavy shrub or herbaceous ground cover for nesting and foraging, mainly in riparian areas and aspen stands. Species such as dusky flycatcher, Cassin's finch, orange-crowned warbler, spotted towhee, and MacGillivray's warbler, which are considered high priority species, could be most affected by this alternative. Ground-nesting birds within these habitats would continue to be vulnerable to livestock grazing through loss of nest cover and the potential for trampling of nests. Mountain mahogany habitat is also critically important to a number of breeding bird species and possibly even more important as thermal cove and foraging habitat of Nevada's wintering birds (Nevada Partners in Flight 1999). While mountain mahogany evolved with natural fire regime, it did not evolve with the double threat of fire and aggressive fire-climax exotics such as cheatgrass, which out competes native plants on burned sites. Under current management the utilization rates would remain at 65 percent on upland grasses and 50 percent on upland shrub species. Sagebrush dependent species such as Brewer's sparrow, green-tailed towhee, sage thrasher, spotted towhee, and vesper sparrow are also affected. A list of birds that are known to occur on the Santa Rosa Ranger District and their nest substrate has been included with the project record.

Riparian areas that are not moving toward vegetation management objectives and that are in low seral stages would continue in this current trend. Areas where willow abundance has decreased or been eliminated altogether due to livestock grazing would continue in this condition affecting species that are dependent upon riparian areas in late seral condition, such as orange-crowned warbler and MacGillivray's warbler. Aspen stands that are not moving toward vegetation management objectives and show poor or no regeneration would also continue in this current trend. In the long term, those aspen stands would continue to decline resulting in many impacts to neotropical migratory birds and their habitats. Implementation of this alternative would continue to benefit species that increase with grazing such as mountain bluebird, robin, and brown-headed cowbird.

Mountain mahogany habitat is also critically important to a number of breeding bird species and possibly even more important as thermal cove and foraging habitat of Nevada's wintering birds (Nevada Partners in Flight 1999). Mahogany sites are important to orange-crowned warbler, MacGillivray's warbler, and dusky flycatcher. While mountain mahogany evolved with natural fire regime, it did not evolve with the double threat of fire and aggressive fire-climax exotics such as cheatgrass, which out compete native plants on burned sites.

Water troughs without escape ramps located throughout the project area would continue to allow for mortality of some species of birds from drowning.

Cumulative Effects

Fuelwood harvest, wildfires, mechanical vegetation treatments, the Buttermilk prescribed burn, mineral exploration, and dispersed recreational activities can alter or affect vegetative communities that provide habitats for a wide variety of neotropical migratory birds. The potential impacts of fuelwood harvest, vegetation treatments, prescribed burns, mineral exploration, and dispersed recreation are generally limited in scope and/or timing and impact only a small percentage of the total available habitats for migratory bird species. The cumulative effects of these activities when compared to the effects associated livestock grazing are considered minimal.

Wildfires have affected nearly 30,000 acres of potential habitats within the northern and western portions of the cumulative effects area over the past 10 years. Many of these habitats are slowly recovering; however, the lowest elevations would generally have long-term impacts associated with cheatgrass invasion. These impacts are cumulative to the effects from livestock grazing, which is the most widespread use within the cumulative effects area and impacts potential habitats for migratory birds. Adverse affects associated with grazing use are generally associated with areas where livestock concentrate, such as springs, meadows, near water developments, along fencelines and near salting locations. Vegetation communities which have been impacted by wildfires, livestock grazing and other uses generally provide some degree of habitat for migratory birds; however, those habitats may be degraded or of reduced quality. Thousands of acres of vegetative communities occur within the cumulative effects area which have had little to no impacts from the uses and events described above. These vegetative communities provide high quality habitats for migratory bird species.

Neotropical migratory birds may also be disturbed or their patterns disrupted by the various activities described above. Disturbance of these species by the various uses and activities are localized in nature and generally short term. Individual migratory birds may be displaced to adjacent habitats; however, there is rarely a loss of habitat except in the case of wildfire.

Establishment of system and user-created routes has had an impact on wildlife. The development of these roads removed wildlife habitat. In addition, the roads fragmented very important and limited riparian habitats. Other effects of these routes include the decline of adjacent habitat through soil compaction; erosion; introduction of noise, people, and associated activities (hunting, camping, etc.); and spread noxious weeds. Disturbance can be especially disruptive to animals when they are nesting or denning and when young animals are beginning to disperse or learning to forage. During the winter when animals are already highly vulnerable to harsh weather and reduced food availability, human encroachment puts more stress on the animals causing them to exert more energy. The Santa Rosa Travel Management decision closed 65 miles of system and user-created routes. Restoring or abandoning these system and user-created routes and closing these areas to motorized use will reduce these negative effects to wildlife.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Livestock grazing under Alternative 2 would continue to affect species requiring heavy shrub or herbaceous ground cover for nesting and foraging, mainly in riparian areas and aspen stands. Species such as yellow warbler and MacGillivray's warbler, which are considered high priority species, could be most affected by this alternative. Ground-nesting birds within these habitats would continue to be vulnerable to livestock grazing through loss of nest cover and the potential for trampling of nests. Mountain mahogany habitat is also critically important to a number of breeding bird species and possibly even more important as thermal cove and foraging habitat of Nevada's wintering birds (Nevada Partners in Flight 1999). While mountain mahogany evolved with natural fire regime, it did not evolve with the double threat of fire and aggressive fire-climax exotics such as cheatgrass, which out competes native plants on burned sites. With the reduced levels of use on shrubland and woodland species, there should be an increase in the health and productivity of shrubs. A list of birds known to occur on the Santa Rosa District and their nest substrate has been included with the project record.

Livestock grazing under this alternative would affect species of birds that use aspen for part of their life history. Under this alternative, there would be a proper use criteria (aspen browse utilization) that would ensure long-term protection of aspen stands that are important to many bird species for both foraging and nesting habitats, which includes orange-crowned warbler and

MacGillivray's Warbler. This alternative would limit the amount of browsing by livestock on young aspen to 20 percent of the seedlings or saplings regardless of the functioning level of the stand. This alternative also implements a maximum utilization limit on herbaceous vegetation within aspen stands. These levels range from 0 to 45 percent. These proper use criteria should allow for sufficient aspen regeneration to maintain stands at a desired functioning level. Those stands that are currently not functioning as desired should move towards functioning as desired. This would improve the long-term potential of these stands to provide nesting habitat for birds and their prey. Under this alternative, the understory vegetation should also be maintained or improved which would provide adequate cover that ground nesting bird species need.

Under this alternative, the proper use criteria applied to most riparian areas (springs and meadows) would be reduced from 65 percent utilization to a maximum of 45 percent. In those areas that do not meet desired conditions, the utilization would be even lower. This would allow for a more rapid recovery of these important habitats.

After the Matrices have been considered in evaluating the uplands (including aspen stands), riparian areas, wet meadows, and springs, there are a variety of management strategies that could be put into place (see Appendix D) to reduce the impacts of livestock grazing to those areas that are not in desired condition. Utilizing various management strategies to reduce the impacts to these areas would allow for faster recovery and reduce impacts to important bird nesting and foraging habitats which would result in an upward trend in condition. This would allow livestock use within these habitats while maintaining sufficient vegetation resources to provide forage and cover for nesting birds and their prey. Implementation of this alternative would benefit species that need increased dense foliage and understory communities in the uplands, such species include orange-crowned warbler, MacGillivray's warbler, spotted towhee, Brewer's sparrow, and sage thrush.

Cumulative Effects

Cumulative effects associated with Alternative 2 would be similar to those disclosed under Alternative 1. The potential cumulative effects related to impacts to vegetative communities used by migratory birds would be reduced as a result of lower proper use criteria in some communities. The communities with the most notable changes as it relates to these bird species include springs, meadows, and other riparian areas, as well as sagebrush and mountain brush communities adjacent to these riparian areas.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3 riparian areas, aspen stands, and understory vegetation would recover and return to desired conditions at a faster pace than under Alternative 1 or 2. Alternative 3 would provide for long-term protection for nesting and foraging habitat important to many neotropical migratory birds. Under Alternative 3 livestock grazing would not occur, providing long-term protection of foraging habitat, increasing long-term viability, and improving habitat condition. No grazing within the project area would improve aspen stands and ensure regeneration, which in turn would benefit nesting habitats for many species of birds. Exclusion of livestock would allow for maximum forb and flower production that would attract insects within the aspen and riparian areas increasing the prey base for many bird species. There would no longer be a risk that livestock may trample nests or chicks of ground nesting birds within the project area.

Cumulative Effects

Under this alternative, grazing would no longer occur within the project area. This would result in fewer adverse impacts and a reduction in overall cumulative effects within the project area. However, this alternative may result in additional livestock grazing impacts on suitable habitats on private lands in the surrounding valleys. These lands contain wet meadows, productive agricultural lands and other areas that provide habitats for migratory birds. Under this alternative, the potential cumulative effects may be displaced from habitats on National Forest System lands to habitats on adjacent private lands.

Issue 4: VEGETATION

EXISTING CONDITION

The Martin Basin Rangeland Project Area vegetation components are characterized by diverse plant communities of mahogany, sagebrush, mountain brush species, expansive stands of aspen, meadows, and streams which create riparian corridors. Table 27 lists approximate acres by dominant vegetation.

The plant's ability to continue to grow healthy roots is critical to its survival. Removal of above ground foliage directly affects its ability to grow roots. When up to 50 percent of the leaves are removed, root growth continues unimpaired. When 50 percent of a plant's leaves are removed, root growth begins to be affected. When 60 percent of a grass plants leaves are removed, the roots cease to grow. This reflects the soundness of the "take half and leave half" rule of thumb (Crider 1955, Dietz 1989). The ability of species to redirect available carbon for shoot root growth as well as the number of above ground growing points are also important in determining a plant response to grazing (Richards and Caldwell 1985). It has also been shown that grazing levels are related to plant residue or litter which is a primary factor for protecting against soil erosion and increasing water infiltration into the soil (Holechek et al. 1998).

Livestock grazing can directly affect plants, injuring or killing them by removing too much of the plants too often which could affect its ability to process sunlight and grow healthy vigorous roots, leaf material, and seeds. Plants subjected to overgrazing would weaken over time, making them less able to grow adequate healthy roots. Above-ground production of leaf material and the plant's capability to store carbohydrates for the following year's growth would be reduced. The plants would also have less capacity to withstand drought, extreme winters, and additional grazing from herbivores.

Over time, if desired plants are weakened through repeated heavy grazing or environmental conditions, other less desirable species that are more adaptable to the impacts may establish. The existing desirable grasses, forbs, and shrub species would decrease. As the less desirable species become more abundant, they may make use of available nutrients and water before or more efficiently than the desirable plants, even further reducing the ability of desirable plants to exist in the community. Some of the less desirable plants may be annuals that die at the end of the year, leaving bare ground that is susceptible to erosion. Shrubs, including sagebrush, may become more abundant and have an increase in canopy cover with a potential loss in ground cover. As herbaceous cover is decreased through heavy grazing, soil loss is accelerated, and the changes result in a downward spiral (Vavra et al. 1999, pg. 178).

Although much of the literature on this matter discusses the effects of livestock grazing at "heavy levels" and compares these effects to no livestock grazing, less of the literature describes the

effects at moderate and light levels. Vavra et al. (1999) summarized that conservative livestock grazing appears to be sustainable over the long term.

In the general sense, livestock grazing undoubtedly has played a role in vegetation changes over the past 150 years, but the exact nature of this role is not clear. Many rangelands still experiencing a downward trend would respond favorably to lighter stocking, but some rangelands have probably reached a point where mere changes in grazing management may not restore them to some previous conditions (Vavra et al. 1999).

The amount of use is not the only factor related to livestock grazing that may affect the plant community. Other factors such as 1) when the area is being grazed and 2) how long the livestock are grazing an area are also critical to livestock management. Even given these other factors when assessing effects to plants for livestock grazing, use levels seem to be the most important factor (Clary and Webster 1989). Holechek et al. (1998) found that differences in utilization levels showed more change in plant response and health than differences in grazing systems.

Riparian

Riparian vegetation communities are generally characterized as being scattered throughout the project area. Although these communities seem common, only 1 to 4 percent of these diverse systems persist in the given geographic area within the Great Basin (Shiflet 1994). Several riparian community types occur within the project area. These include wet meadows, moist meadows, dry meadows, cottonwood, aspen, and willow communities.

Riparian communities are found within all allotments in the project area. The western and southern portions of the Santa Rosa Range are generally characterized with deep canyons where the riparian community is confined to the creek bottoms and small isolated springs and seeps. Willows are the dominant riparian vegetative community on the west side of the range. Remnant cottonwood species are found at lower elevations. Riparian communities on the eastern and northern portions of the Santa Rosa Range are typically not confined to deep canyons but rather large areas of broad valley bottoms. Steeper gradient streams surround these broad valleys. Isolated meadows, springs, and seeps are more common and scattered throughout the project area on the east side of the range. The riparian communities within the broad valley bottoms have been primarily impacted by historic livestock grazing.

Table 27. Acres by Dominant Vegetative Type[7].

COVER TYPES	BRADSHAW	BUFFALO	BUTTERMILK	GRANITE PEAK	INDIAN	MARTIN BASIN	REBEL CREEK	WEST SIDE FLAT CREEK	TOTAL
Riparian	57	56	224	30	5	241	31	35	679
Aspen	9	2,926	2,767	3,378	330	1,204	3,118	1117	14,849
Uplands									
Grassland	0	3,327	1,547	3,431	894	730	2,337	3,095	15,361
Wyoming Big Sage	2,049	1,701	4,205	2,827	4,637	4,992	1,504	2,156	24,071
Basin Big Sage	0	97	235	734	498	35	99	50	1,748
Mountain Big Sage	532	5,764	10,081	15,434	9,641	6,396	4,036	6,419	58,304
Mountain Brush	150	3,974	3,698	6,312	544	3,782	2,963	3,602	25,026
Low Sage	666	1,443	5,890	2,654	1,194	12,035	722	1,562	26,167
Mountain Mahogany	2	977	1,974	991	140	1,483	720	421	6,708
Other (barren/snow/isolated forest)	5	647	715	1,311	197	397	503	700	4,475
Grand Total	3,470	20,912	31,336	37,103	18,081	31,295	16,033	19,156	177,387

[7] Vegetation map types were characterized by dominant land cover type, canopy closure class, and tree size class (Gillman et al. 2004). This existing vegetation map adheres to mid-level mapping standards while utilizing innovative techniques to assess dominance type, canopy closure, and tree size class map (Gillham et al. 2004). Mapping methods included using "multiple sources of remote sensing imagery, training samples, and geospatial data layers with image segmentation and data-mining technologies". The minimum polygon size was 5 acres with 0.50 acre for riparian areas. Table 27 lists approximate acres by dominant vegetative type.

Wet Meadow Community Type

Wet meadow community types are generally associated with seeps and springs at a groundwater depth of 10 to 100 centimeters (Appendix A). Currently, wet meadows have probably decreased since the turn of the century. Wet and dry-to-moist meadow types, most likely the first plant communities to experience cattle impacts, have been impacted by cattle grazing more than any other vegetation community on the Santa Rosa Ranger District. Soil compaction and down cutting of stream channels have reduced available soil moisture to the extent that it prohibits the growth of wet meadow species such as Nebraska sedge (*Carex nebrascensis*) and reedgrass (*Calamagrostis canadensis*).

Historical heavy grazing has converted many of these wet meadows to species such as dock (*Rumex spp*.), thistle (*Circium spp*.), water hemlock (*Cicuta douglasii*), yellow pea (*Thermopsis Montana)*, dandelion (*Taraxacum officinate)*, western yarrow (*Achillea millifolium)*, aster (*Symphyotrichum spp*.), and false hellebore (*Veratrum californicum)*. These species have a deep tap root system and can extract water from compacted soils.

Manning and Padgett (1995) suggest that management of these communities should allow for re-growth at the end of the grazing season in order to replenish spring growth. The typically wet, fine-textured soils are susceptible to compaction and hummocking by excessive livestock use, particularly if the sod layer is broken and hummocks are present. Under severe grazing pressure, especially when accompanied by a drop in the water table, Nebraska sedge can be replaced by species with wider ecological amplitude, such as Baltic rush (*Juncus balticus*), meadow barley (*Hordeum brachyantherum*), and Kentucky bluegrass (*Poa pratensis*) (Manning and Padgett 1995).

Dry-to-moist Meadow Community Type

Dry-to-moist meadow community types occur within the project area and are generally associated with creeks and areas where the depth to groundwater is 100 centimeters or greater for dry meadows and 55-100 centimeters for the moist meadow community (Appendix A). In a functioning condition, these meadows would be occupied by species such as Sandberg bluegrass, (*Poa secunda*), slender wheatgrass (*Elymus trachycaulus*), Great Basin wildrye (*Leymus cinereus*), tufted hairgrass (*Deschampsia caespitosa*), oatgrass (*Danthonia spp*.), and Douglas sedge (*Carex douglasii*). Because tufted hairgrass is a bunchgrass, which reproduces by seed, it has a competitive disadvantage compared to rhizomatous sedges and grasses.

Wet and dry-to-moist meadow types are most likely the first plant communities to experience cattle impacts and have been impacted by cattle grazing more than any other vegetation community. Early in the grazing season when water is more abundant, cattle generally stay out of the wet meadow areas, congregating in the dry-to-moist meadow vegetation. Many of the dry-to-moist meadows within the project area have experienced a loss of soil moisture resulting in a conversion to drier meadow or upland plant species. The typically clayey or clayey skeletal soils are susceptible to compaction when wet. As sites dry, they are less likely to be compacted under light to moderate grazing (Manning and Padgett 1995).

Historical heavy grazing has converted many of these meadows to species such as Kentucky bluegrass (*Poa pratensis*), meadow foxtail (*Alopecurus pratensis*), foxtail barley (*Hordeum jubatum*), creeping bentgrass (*Agrostis stolonifera*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), and bulbous bluegrass (*Poa bulbosa*). California false hellebore and mountain goldenbanner are becoming more and more common in moist-to-dry meadows. Both

species are not preferred by livestock or wildlife and appear to have increased over the last few years.

Cottonwood Community Type

Cottonwood (*Populus angustifolia* and *P. balsamfiera* ssp. *trichocarpa*) communities occur within the project area along lower elevation streams. Cottonwood stands vary in size throughout the project area. Cottonwood communities are found within portions of the Buffalo, Granite Peak, Rebel Creek, and West Side Flat Creek Allotments. Larger cottonwood stands occur on the west side of the Santa Rosa Mountain Range, in deep canyons and riparian areas.

When functioning, the following forb species would be present in the understory: wild geranium, wild peony (*Paeonia brownii*), marsh violet (*Viola palustris*), western white clematis (*Clematis ligusticifolia*), silver lupine, and wild onion (*Allium spp*.). Graminoid species include Great Basin wildrye, slender wheatgrass, mountain brome, and Sandberg bluegrass. Species present in undesirable conditions include thistle (*Circium spp*.), dandelion, tansy mustard (*Descurainia pinnata*), aster, cinquefoil, smooth brome, Kentucky bluegrass, cheatgrass, and bulbous bluegrass.

Within the project area, regeneration is lacking in a few remnant stands due to livestock and/or deer and elk grazing, alterations of the water flow and stream channels, disease, lack of available soil moisture, recreation, fire suppression, and poor genetic variability (Manning and Padget 1995; Padget et. al. 1989). Most of the stands on the southwest portion of the project area are recovering from past grazing and floods. Much of this recovery can be attributed to a reduction in livestock numbers after 1994. Photo 1 shows numerous suckers and vigorous regeneration in Canyon Creek on the West Side of Flat Creek Allotment in 2007, following the Upper Willow Fire of 2001. Site visits in Canyon Creek during the summer of 2007 showed continued vigorous regeneration of these stands with little to no impacts from ungulate (deer, elk, and cattle) browsing. Although most cottonwood stands within the project area appear healthy, there are stands along lower elevation streams that have been degraded by livestock grazing and dispersed recreation activities. In 2006 the District personnel planted several hundred cottonwood seedlings within Three Mile Creek, Canyon Creek, Falls Creek, and Indian Creek to increase the genetic diversity in these populations.

Photo 1. Cottonwoods Recovering from the Upper Willow Fire (2001) in Canyon Creek on the West Side Flat Creek Allotment (2007).

Stream Communities

Stream communities are common in all allotments within the project area. Streams range from steep gradient willow dominated streams to lower gradient systems with a mixture of meadows, willows, and occasional beaver dams as found in the Quinn River and Martin Creek watersheds. Several willow species (*Salix spp*.) occur in the project area within riparian communities. Willows provide habitat and shade to wildlife, streambank stability, and root structures that withstand high water flows. The depth to groundwater is generally 0-50 centimeters. Willow species that occur in the project area include Geyer willow (*Salix geyeriana*), Booth willow (*Salix boothii*), Pacific willow (*Salix lucida* ssp. *lasiandra*), yellow willow (*Salix lutea*), and coyote or narrowleaf willow (*Salix exigua*).

As a general observation, within the project area most perennial streams, and in particular those that are dominated by willows, have shown the best improvement in conditions. Historic livestock grazing has impacted willow species, particularly in the low gradient streams in the broad valley bottoms due to browsing of new lateral shoot growth and young seedlings. Mature willow species found within the Indian Allotment, Martin Basin Allotment, and areas where cattle tend to congregate for long periods of time, lack lateral shoots resulting in a mushroom-shaped willow; also called “high-lining”. To a moderate extent, some down-cutting has resulted in a species conversion from willows to wild rose and big sagebrush within the project area.

Aspen Communities

Aspen stands on the Santa Rosa Ranger District are found from approximately 6,000 feet in elevation along streams to approximately 9,500 feet in elevation just below some of the highest peaks on the District. Aspen are found in all allotments included in this analysis; however, the dominant aspen stands are most common within the Buttermilk, Buffalo, Granite Peak, Martin

Basin, Rebel Creek, and West Side Flat Creek Allotments (Table 27). Aspen communities have high biodiversity, second only to riparian areas on western ranges (Nevada Comprehensive Wildlife Conservation Strategy 2004). These stands are also important for watershed protection and have high values for recreation. Aspen communities on the Santa Rosa Ranger District lack conifer encroachment and generally have sufficient regeneration to ensure long-term stability of the stands (Photo 2).

Repeat photo points and more recent site visits and reviews of aspen communities in the project area have shown that most aspen stands are in a stable and healthy condition. Reviews document that older trees in the stands have been impacted by drought, insects, and diseases which are common in the stands resulting in mortality in the overstory (Guyon 2006). These same reviews have documented that in nearly all cases there is sufficient regeneration in the stands to ensure long-term stability of the stands. It is estimated that 80 to 90 percent of all aspen stands in the project area are stable and relatively healthy with vigorous understory regeneration (Guyon 2006).

Photo 2. Alkali Creek in the Buttermilk Allotment.
(Typical high elevation aspen stands within the project area.)

Aspen stands are recovering over time with the change in livestock management since the 1930s as evidenced by the increase in aspen stands. The photo record below (Photo 3 and 4) is a south view from Hinkey Summit within the Granite Peak Allotment which is typical of the District. Vegetative cover in the photos includes mountain brush, sagebrush, native grass, and patches of aspen. Paradise Valley is in the distance. Of particular interest is the size and structure of the stands near the center of the photos. There has been a significant increase in the size of the stands.

Photo 3. Indian Creek off Hinkey Summit (August 1938) in the Granite Peak Allotment.
(Note the small aspen stands in the center of the photograph.)

Photo 4. Indian Creek off Hinkey Summit (July 15, 2003) in the Granite Peak Allotment.
(The aspen stands have increased in size and canopy density.)

Upland Vegetation Communities

Sagebrush Communities

The three major sagebrush communities found in the project area are Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and low sagebrush (*Artemisia arbuscula*). Other sagebrush species such as basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) also exist in the project area. They are often intermixed with the major species or occur in small patches within the major communities identified above and have similar impacts and potential risks. These sagebrush communities vary widely and are found throughout the project area between 5,500 to 9,000 feet in elevation. Sagebrush communities on the west side of the project area are generally a mix of young stands that may be dominated by cheatgrass at the lower elevations, as a result of repeated large fires, while the remaining stands tend to be mature sagebrush (USDA Natural Resources Conservation Service 2002).

Wyoming Big Sagebrush

Wyoming big sagebrush is generally located on the periphery of the project area between 4,500 and 6,800 feet in elevation with 6 to 13 inches of precipitation (Appendix A). Wyoming big sagebrush communities are found primarily within portions of the Buttermilk, Granite Peak, and Indian Allotments. This community is limited to lower elevations and/or south facing exposures. Wyoming big sagebrush is the most drought tolerant of the three major big sagebrush subspecies (Howard 1999).

In functioning Wyoming big sage communities, the understory species consist of perennial grasses, forbs, and native annuals (Appendix A). Graminoids that may occur include cool-season perennial grasses that are potentially the dominant herbaceous plants in the sagebrush-grass plant communities, basin wildrye, Indian ricegrass (*Achnatherum hymenoides*), Thurber's needlegrass (*Achnatherum thurberianum*), needle and thread (*Hesperostipa comata*), squirreltail (*Elymus elymoides*), and blue bunch wheatgrass (*Pseudoroegneria spicata*). Forbs, which may be present, include scarlet globemallow (*Sphaeralcea coccinea*), Hood's or spiny phlox (*Phlox hoodii*), longleaf phlox (*Phlox longifolia*), lupine (*Lupinus sp*.), biscuitroot (*Lomatium sp*.), Indian paintbrush (*Castilleja sp*.) and other associated forbs. Associated shrub species may include green rabbitbrush (*Chrysothamnus viscidiflorus*) and rubber rabbitbrush (*Ericameria nauseosa*).

When fires occur in Wyoming big sagebrush sites, with understories primarily consisting of non-native annuals, such as cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*), these sites tend to convert to annual weedy habitats lacking a sagebrush overstory (Brooks and Pyke 2002). These sites are then more susceptible to frequent fire intervals and are difficult to restore to their previous productivity and condition (Brooks et al. 2004). Adjacent lower elevation lands are currently experiencing the conversion to cheatgrass at a much faster pace than higher elevation National Forest System lands. However, the cheatgrass conversion cycle is slowly moving up in elevation and is most prominent on the west side of the project area.

Mountain Big Sagebrush

Mountain big sagebrush communities are found within all allotments in the project area, and are the most common vegetative community on the Santa Rosa Ranger District. Mountain big sagebrush occurs between 7,000 and 10,000 feet in elevation, occupying the upper sagebrush

precipitation zone of 10 to 25 inches annually (Appendix A). Soils are moderately deep, well drained, and include a high rock or gravel component (USDA Natural Resources Conservation Service 2002).

The graminoid understory is generally composed of basin wildrye, Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass, Thurber's needle grass, Sandberg bluegrass, mountain brome (*Bromus marginatus*), and other associated species. Shrubs, which may be present, include snowberry (*Symphorivarpos oreophilus*), serviceberry (Amelanchier sp.), and antelope bitterbrush (*Purshia tridentata*). Isolated individuals of curl-leaf mountain mahogany are also found within this community.

Mountain big sagebrush stands generally produce forage for livestock and wildlife. On these sites, cheatgrass may increase over time, although not to the extent of drier sagebrush stands. Mountain big sagebrush is easily impacted by fire; however, reestablishment is quicker due to the abundance of available seed. Other shrubs (e.g., green rabbitbrush and gray horsebrush (*Tetradymia canescens*)) are quick to sprout after fire and increase with reoccurring fire events, forming dense stands.

Low Sagebrush

Low sagebrush occurs in the project area at moderate to high elevations (5,000 to 9,000 feet). Low sagebrush communities are found scattered throughout portions of all allotments in the project area and generally occur in a mosaic with one of the big sagebrush types.

A shrub layer of low sagebrush and herbaceous layer of perennial bunchgrasses and forbs characterize this community. The graminoid layer includes bluebunch wheatgrass, squirreltail, and Sandberg bluegrass. Cheatgrass is common but usually not as abundant as in the Wyoming big sagebrush community at lower elevations. Herbaceous forb species include wild onion, phlox, vetch (*Astragalus spp.*) and pussytoes (*Antennaria spp.*)

Mountain Brush

Mountain Brush Community

Several shrub dominated types have been grouped under mountain brush. Dominant shrub species may include antelope bitterbrush (*Purshia tridentata*), serviceberry (*Amelanchier utahensis*), wax current (*Ribes cereum*), gooseberry current (*Ribes montigenum*), snowbrush (*Ceanothus velutinus*), and snowberry (*Symphoricarpos oreophilus*). The mountain brush group occurs between 6,000 to 10,000 feet in elevation and receives 12 to 22 inches of precipitation annually, mostly in the form of snow (Appendix A).

The graminoid understory is generally composed of basin wildrye, Idaho fescue, bluebunch wheatgrass, slender wheatgrass (*Elymus trachycaulum*), western needlegrass (*Achnatherum occidentale*), Letterman's needlegrass (*Achnatherum lettermanii*), squirreltail, needle and thread, and mountain brome (Appendix A).

Large stands of mountain brush are most common within the Buttermilk, Buffalo, Martin Basin, Granite Peak, and Rebel Creek Allotments on moister sites than sagebrush and near or within large aspen stands. The mountain brush community supports a diverse group of plant species;

provides important watershed values, cover, and protection for wildlife; and provides good forage for many wildlife species.

Mountain Mahogany

Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) is an evergreen shrub or small tree up to 23 feet tall. Mountain mahogany is very intolerant of fire and is a valuable browse plants for game animals within the project area. Mountain mahogany is among the most palatable of shrubs to all classes of browsing animals. The largest stands are located within the Buttermilk and Martin Basin Allotments (Table 27).

Curl-leaf mountain mahogany stands have increased in size and structure in the Martin Basin Project Area. Photo comparisons on the Martin Basin Project Area indicate that 80 percent of the sites compared are increasing in size and/or density of the canopy (Table 29). Most stands are mature with young trees being established on the outer edges of the stands. This expansion of the stands is occurring as a result of suppression of fires allowing the fire intolerant mahogany to expand into mountain big sagebrush and mountain brush communities. Some isolated small stands may be in less than desirable condition when they occur in areas where livestock congregate or where recreational activities may impact the health of the stands. A few mahogany stands on the Indian and West Side Flat Creek Allotments have been impacted by large catastrophic wildfires that have occurred in the past 20 years.

Noxious Weeds

Noxious weeds are highly invasive plants that generally possess poisonous, toxic, parasitic, invasive, and aggressive characteristics. Noxious weeds are defined by federal or state laws. Other invasive species such as cheatgrass will be discussed in the vegetation sections.

The presence of noxious weeds signifies an area is at risk from a health and sustainability viewpoint, whether or not the landscape is disturbed or pristine (O'Brien et al. 2003). Noxious weeds are highly invasive and have the potential to spread throughout the project area if not managed intensely. Infestations reduce the amount of available forage for wildlife and livestock, and have the ability to take over large areas of land, reducing valuable public land resources (Nevada 2008).

The project area has several known locations of noxious species which are on the Nevada State Noxious Weeds List (Johnson and Wilson 2003). Noxious weed infestations of varying sizes and species occur throughout the project area (Table 28). These species include Canada thistle (*Cirsium arvense*), hoary cress (*Cardaria draba*), leafy spurge (*Euphorbia esula*), medusahead (*Taeniatherum caput-medusa*), Russian knapweed (*Acroptilon repens*), Scotch thistle (*Onopordum acanthium*), and yellow toadflax (*Linaria vulgaris).* These species typically dominate areas after major disturbances such as fire, overgrazing, or heavy recreational use. Noxious weeds are capable of producing highly viable seeds, which can persist in the soil for several decades (D'Antonio and Meyerson 2002). Noxious weed seed is easily transported and dispersed by livestock, wildlife, recreation, and motor vehicles (BLM 1998, Freilich et al. 2003).

As of February 2003, the Intermountain Regional Forester signed a Noxious Weed Free Hay Order. Pursuant to 36 CFR 261.50 (a) and (b) CFR 261.58(t), a Regional Forester may prohibit possessing, storing, or transporting any part of a tree or other plant, as specified in the order. This order prohibits the transport and storage of any hay products onto National Forest System lands unless the products are certified by the state of Nevada as noxious weed free.

Canada Thistle (Cirsium arvense)

Canada thistle occurs on the East Fork and South Fork of the Quinn River within the riparian community on the Indian Allotment. The infestation spans large sections of the river. Small infestations are also known to occur at a small spring in the Cabin Creek and Blackridge Pastures on the Martin Basin Allotment, Buttermilk Spring on the Buttermilk Allotment, and along the South Fork of Indian Creek in the Granite Peak Allotment. Canada thistle spreads by both seed and creeping rootstocks.

Hoary Cress (Cardaria draba)

Hoary cress or whitetop is common along many Forest roads within the project area. This plant is generally found along roadsides; however, some large patches occur in disturbed areas within the project area and on several allotments.

Russian Knapweed (Acroptilon repens)

Russian knapweed or hardheads has been identified in several locations on the Bradshaw, Buttermilk, Granite Peak, and Indian Allotments. Russian knapweed is widespread at lower elevations on private lands in Paradise Valley and on the Fort McDermitt Indian Reservation. Russian knapweed is an aggressive perennial weed that reproduces from seed and vegetatively from a creeping root system (Sheley and Petroff 1999). Range and weed scientists consider it a serious habitat invader because of its aggressive nature and allelopathic properties (Sheley and Petroff 1999).

Scotch Thistle (Onorpordum acanthium)

In August 2001, the Upper Willow Fire burned approximately 41,800 acres, with approximately 25,270 acres on National Forest System lands. Major drainages burned included Willow Creek, South Fork Willow Creek, Canyon Creek, South Fork Canyon Creek, Flat Creek, South Fork Flat Creek, Three Mile Creek, and Skull Creek. These drainages make up portions of the West Side Flat Creek and Granite Peak Allotments. Scotch thistle has increased substantially in the burned drainages. Scotch thistle is also common on the South Fork and East Fork of the Quinn River on the Indian Allotment. Other small infestations occur on the remaining allotments in the project area. Scotch thistle is an invasive species that spreads primarily by seed and forms dense stands impermeable to livestock, wildlife, and recreationalists. Each plant can produce thousands of seeds that can remain in the soil for several decades. Populations have been monitored and treated with intense herbicide applications.

Yellow Toadflax (Linaria vulgaris)

In 2006, a small infestation of yellow toadflax or butter and eggs was identified and treated in the Spring City Pasture on the Buttermilk Allotment. No additional infestations are known at this time. Yellow toadflax is often found in well-drained, relatively coarse textured soils varying from coarse gravels to sandy loams, but is sometimes found in heavier soils (Sheley and Petroff 1999). Where sod-forming or bunch-grass communities are replaced by toadflax, soil erosion, surface runoff, and sediment yield can be increased (Sheley and Petroff 1999). Even in pristine areas and on rangelands in excellent condition, new infestations of yellow toadflax can establish in naturally occurring disturbances or small openings. Once the highly competitive vegetative

growth begins, the condition of the rangeland will probably do little to slow expansion of the infestation (Sheley and Petroff 1999).

Leafy Spurge (Euphorbia esula)

Leafy spurge has been found on the Spring City Pasture on Buttermilk Allotment and in several drainages outside of the project area, which border the Granite Peak Allotment. Leafy spurge is common within Paradise Valley, where the local weed district has made it a high priority for control efforts. Leafy spurge is a perennial noxious weed, capable of spreading by seed or creeping roots, and known to inhabit nearly all soil types. The seed components are able to spread from an explosion in the seed capsule and may reach up to 20 feet in distance.

Medusahead (Taeniatherum caput-medusa)

Medusahead may occur within the project area. There are known locations of this weed on BLM and private lands immediately adjacent to the project area. There have been undocumented reports of medusahead infestations on both the Granite Peak and Indian Allotments. Medusahead is a winter annual grass, exhibiting long, awned-spiked, inflorescences. Medusahead germinates in fall, winter, or spring. Root growth can proceed through the winter, when little above-ground growth may be apparent (Sheley and Petroff 1999). Medusahead is almost worthless as forage for cattle and sheep (Sheley and Petroff 1999). Medusahead has very little to no value to wildlife. Although the litter layer may be of some value in protecting the soil from wind and water erosion, the short-lived roots of medusahead will not hold the soil as well as the root network of an established perennial community (Sheley and Petroff 1999).

Other Noxious Weeds

The following species are not known to occur within the project area; however, there are infestations adjacent to the project area, with potential for them to become established. These include spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), yellow starthistle (*Centaurea solstitialis*), rush skeletonweed (*Chondrilla juncea*), Dalmatian toadflax (*Linaria dalmatica*), musk thistle (*Carduus nutans*), puncturevine (*Tribulus terrestris*) and tall whitetop or perennial pepperweed (*Lepidium latifolium*). District personnel aggressively monitor for weed infestations annually. New infestations would receive the highest priority for treatment.

Table 28. Mapped Acres of Noxious Weeds by Allotment.

ALLOTMENT	CANADA THISTLE (acres)	HOARY CRESS (acres)	RUSSIAN KNAPWEED (acres)	SCOTCH THISTLE (acres)	YELLOW TOADFLAX (acres)	LEAFY SPURGE (acres)	GRAND TOTAL (acres)
Bradshaw	5		0.2				5
Buffalo				62			62
Buttermilk	4	8	1	33	1	1	48
Granite Peak	3	3	3	42		3	54
Indian	83	8		6			97
Martin Basin	39			0.1			39
Rebel Creek							
West Side Flat Creek	0.1	170		208			378

EXISTING CONDITION OF VEGETATION ON PROJECT AREA ALLOTMENTS

The rangeland conditions in the Martin Basin Rangeland Project Area were determined by a variety of studies, inventory methods, and monitoring protocols. Studies that determined the condition and health of Martin Basin Project Area were collected in the field by many different types of data collection methods such as the Matrices, nested frequency, line intercept, ground cover, ocular analysis, repeat photo points, fenceline comparisons, benchmark analysis, apparent trend studies, GAWS, and properly functioning condition (Cowley and Burton 2005, Dixie and Fishlake National Forests 2002, Kay 2003, USDI BLM 1996(a), USDI BLM 1996(b)). Review of all available data sources, site visits, and professional expertise and knowledge was used to determine condition of each pasture based on the attributes listed in the Matrices (Appendix A). Summaries of these studies are presented for the entire project area and allotments. Detailed descriptions are included in the Vegetation Specialist Report. The original studies can be found in the project record.

Martin Basin Rangeland Project Area

Repeat photos can be used to document changes in major plant communities, however, detecting changes in herbaceous species composition from grazing is limited (Kay 2003). Repeat photos were used to estimate change in vegetation for grasses, sagebrush, mountain brush, mahogany, aspen, and woody riparian (willows) over time. Photo point comparison is used to determine the vegetation and soil stability change over time as increasing, static, or decreasing in size and/or density. It is not used to determine overall health of the project area and does not determine the health of a particular vegetation type.

Repeat photos were compared and general vegetation change determined using an example produced by Utah State University Extension and the Fishlake National Forest (Kay 2003). Photos were originally taken from 1915 to 1994 and were repeated from 1980 to 2007. Photo points were assessed by estimating a change in features for the following classes: grasses, sagebrush, mountain brush, aspen, woody riparian, mahogany, plant cover, and changes in erosion to determine change over time (Table 27). Ratings were given based on whether there was no change, slight change, moderate change, or greatest amount of change. The photos were compiled into electronic format and organized into Microsoft Powerpoint for visual comparison (available in the project record). One photo could possibly be compared for all classes of vegetation and for the plant cover and erosion, for a possible total of eight comparisons. There are a total of 78 photos and 458 compared classes within the project area. The percentage of photos in each category of change was calculated within each vegetation type or class (Table 27).

Table 29. Summary of Total Percent Vegetation Changes in each Comparison Class within the Martin Basin Rangeland Project Area (78 repeat photos over 486 comparison classes).

CLASS TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	4%	32%	64%
Sagebrush	16%	47%	37%
Mountain Brush	2%	19%	79%
Aspen	0%	17%	83%
Mahogany	6%	14%	80%
Woody Riparian	3%	19%	78%
Plant Cover	5%	27%	68%

Grasses, mountain brush, aspen, mahogany, and woody riparian have all increased in size and/or density across the Martin Basin Rangeland Project Area based on repeat photo analysis (Table 27). Many factors contributed to the change in vegetation. Sagebrush, mountain brush, and mountain mahogany have likely increased due to the lack of fire at higher elevations. Increases in grasses, aspen, and woody riparian vegetation are due to reductions in grazing numbers, changes in season of use, and range improvement projects such as prescribed fire, mechanical treatments, and seeding projects. Active erosion appears to have declined showing a 72 percent decrease (Table 27). Evaluation of repeat photos indicated reduced erosion and increased plant cover at most sites leading to better protected soils.

The following sections summarize the current condition and trends for the various vegetative communities on the individual allotments. The information contained in these sections is based on available monitoring data, condition assessment using the Matrices (Appendix A), photo points, photo comparisons, nested frequency and range trend studies, site analysis, ocular estimates, attributes from multiple years of GAWS, District personnel's professional observations, site visits and knowledge of the area (see Vegetation Specialist Report for detailed discussions).

The Nevada Department of Wildlife has conducted General Aquatics Wildlife Surveys on various streams throughout the Martin Basin Rangeland Project Area over the past 20 years (USDA Forest Service, MB MIS/Rangeland Capability Report, 2008, Table 1 – GAWS data). Components of those surveys included percent bank soil stability and percent bank vegetation stability. These attributes were analyzed to help establish current conditions and apparent trends for riparian vegetation on streams within the various allotments. If bank soil stability and vegetation stability were in satisfactory condition, then the streambank stability (long-term measure) should also be in functioning condition. Criteria for determining streams in satisfactory condition were used that would be similar to the conditions described in the Matrices for a functioning system. An attribute for ungulate (elk, deer, cattle) damage rating was not used in this analysis. This attribute varies widely by time of year, annual allotment management, and other factors, and is not reliable in establishing trend or condition of vegetation.

Bradshaw Allotment

The Bradshaw Allotment is located entirely within the headwaters of the Martin Creek Watershed. Streams in the Bradshaw Allotment are generally characterized as being low gradient meandering streams scattered throughout the broad valley bottoms in the Martin Creek Basin. Meadows adjacent to streams are common in this allotment and provide important habitat for wildlife species such as sage grouse. Major streams within this allotment include Bradshaw Creek, Dutch John Creek, and Road Creek.

The dominant vegetation community in this allotment is Wyoming big sagebrush (Table 27). Other important vegetative communities within the Bradshaw Allotment include low sagebrush, mountain big sagebrush, mountain shrub, mountain brush, riparian, and aspen. Almost all of the allotment is below 6,700 feet and at risk for invasion of cheatgrass. Bradshaw Allotment is currently vacant and has not been used by a term grazing permit holder since 1994. This allotment has been used in emergency situations such as fire or drought impacts on other allotments.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, the uplands and aspen vegetation communities are functioning. Evaluated meadow systems in the allotment are functioning-at-risk due to issues with species composition and bare ground. However, the woody riparian systems are in satisfactory condition. The small aspen stands appear to be improving in condition which is similar to aspen across the project area. Noxious weeds are limited in this allotment to small isolated patches.

Using 14 photos taken within the Bradshaw Allotment, a total of 56 comparative classes were evaluated. Repeat photos were taken at a variety of intervals with most photo sets between 1961 and 2001 (45 years). One photo set comparing change over 13 years (1993 to 2006) showed no changed. Comparative classes on the Bradshaw Allotment show that all groups evaluated had an increase in size or density except sagebrush. The amount of sagebrush within this allotment decreased primarily from past prescribed fires and sagebrush treatments (Table 30). Mountain mahogany increased in size and/or density due to fire suppression. Aspen continues to improve with some increase in canopy and/or size.

Table 30. Summary of Total Percent of Vegetation Changes in each Comparison Class within the Bradshaw Allotment (14 repeat photos over 56 comparison classes)**.**

VEGETATION TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	0%	29%	71%
Sagebrush	43%	43%	14%
Aspen	0%	33%	67%
Mahogany	0%	17%	83%
Plant Cover	0%	14%	86%
Erosion	79%	21%	0%

RIPARIAN

Streams

Within the Bradshaw Allotment, streams are dominated by woody riparian species and in functioning condition. Road Creek and the Main Fork of Dutch John Creek are both in satisfactory condition and have improved vegetative condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1- GAWS data).

Seeps, Springs, and Meadows

Meadows are located along Bradshaw Creek and portions of Dutch John Creek. Seeps and springs are very limited within this allotment. Multiple years of rest and changes in management during the early 1990s allowed these areas to recover. Condition assessments for meadows were done using the Matrices. Matrices were placed on five sites on the Bradshaw Allotment on dry-to-moist meadow (four in 1995 and one in 2001) (Table 31). The studies found all sites to be functioning-at-risk due to undesirable species (forbs, sagebrush, and rabbitbrush) and/or the amount of bare ground exceeding 5 percent. No recent assessments of condition have been made although repeat photographs indicate increased cover at Bradshaw Creek (Vegetation Specialist Report).

Table 31. Data for the Bradshaw Allotment[8].

PLOT CODE	STUDY NAME	DATE	VEGETATION TYPE	CONDITION	PERCENT BARE GROUND (Functioning <5%)
21965	Bradshaw Creek	2001	Dry-to-Moist Meadow	Functioning-at-Risk	2%
95803	Bradshaw Field	1995	Dry-to-Moist Meadow	Functioning-at-Risk	13%
95806	Dutch John 1A	1995	Dry-to-Moist Meadow	Functioning-at-Risk	76%
95807	Dutch John 1B	1995	Dry-to-Moist Meadow	Functioning-at-Risk	4%
95808	Dutch John 1C	1995	Dry-to-Moist Meadow	Functioning-at-Risk	19%

ASPEN

Within this allotment, aspen stands are very limited (Table 27). These limited stands are on a distinct upward trend. The stands have a diverse age class and are expanding. Photo comparisons on the Bradshaw Allotment indicate that 67 percent of the aspen are increasing while aspen in 33 percent of the photo pairs showed no change (Table 30).

UPLANDS

Sagebrush

These communities make up the largest acreages of any vegetation class managed on the Bradshaw Allotment (55% of the allotment, Table 27). The dominant sagebrush is Wyoming big sagebrush (2,049 acres), followed by low sage (666 acres), and mountain big sagebrush (532 acres). The Wyoming big sagebrush communities are not dominated by cheatgrass, however, increased fire frequency could increase cheatgrass in the understory. A comparison of the photo sets in Table 30 illustrates that approximately 14 percent showed increasing sagebrush size/density, 43 percent showed no change, while 43 percent showed decreasing sagebrush size/density. While the sagebrush component showed a decrease, 71 percent of the photo pairs showed an increase in the grass component. In 2006, the Buttermilk Prescribed Burn Project was implemented within portions of the allotment and increased the mosaic pattern within the mountain big sagebrush communities.

Curl-leaf Mountain Mahogany

There are small stands of mountain mahogany within this allotment. As outlined in Table 30, photo comparisons on the Bradshaw Allotment indicate that 83 percent showed increasing mountain mahogany stand size. Due to the lack of fire, mountain mahogany stands are expanding and have encroached on other vegetation communities including sagebrush and mountain brush. Most mountain mahogany stands on the allotment are characterized by a core of mature trees surrounded by a band of young trees expanding into other vegetative communities.

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[8] (Collected with the Matrices and analyzed with criteria set up by the Matrices. Individual study data can be viewed in the project record.)

Mountain Brush

On higher elevation mountain slopes, mountain brush communities dominated by snowberry and other species are generally healthy and have increased substantially. Within lower and mid-elevation communities, mountain brush is dominated by bitterbrush, which generally lacks a diversity of age classes. For this vegetation community, the primary concern on the Bradshaw Allotment is near Road Creek. In this area, there are some large stands of bitterbrush that are very old and becoming decadent. The understory of these stands has an increasing component of cheatgrass. These areas are at risk for fire and ultimately conversion to cheatgrass.

NOXIOUS WEEDS

Noxious weed infestations are limited on the Bradshaw Allotment (5 acres, Table 28). Noxious weeds known to currently occur on the Bradshaw Allotment include Canada thistle, hoary cress (not mapped), and Russian knapweed. Noxious weed infestations on the Bradshaw Allotment are located in small isolated pockets and generally do not appear to be increasing in size. Hoary cress is found along many roadsides and may be expanding along these roads. Recent treatments have focused on controlling and reducing the spread of this species. Noxious weed treatments appear to be effective at controlling and minimizing infestations on this allotment.

Buffalo Allotment

The entire Buffalo Allotment is located on the western face of the Santa Rosa Mountains on the southern portion of the District with a large portion of the allotment in the Santa Rosa–Paradise Peak Wilderness. The allotment is characterized by steep rugged mountain terrain with some open basins of sagebrush. The allotment is dissected by an abundance of small drainages that are generally subsurface in the Quinn River Valley. Streams on the Buffalo Allotment are generally steep gradient, dominated by willow, and to a lesser extent aspen communities. The dominant streams within the allotment include Horse, Falls, Buffalo, Andorno, Chimney, and Porcupine creeks. Spring, seeps, and meadows occur in this allotment and provide important habitat for wildlife species. The dominant vegetative communities within the Buffalo Allotment include mountain big sagebrush, large stands of aspen, and mountain brush.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, the uplands, riparian, and aspen vegetation communities are functioning and the condition continues to improve for uplands and riparian areas. Range analysis since 1961 has shown an improvement in the upland conditions. Currently, the overall condition of the uplands is functioning with isolated issues near riparian areas and low elevations with invasion of cheatgrass. However, specific problems have been identified at the headwaters of drainages within the Buffalo Allotment including Singas Peak due to historic grazing practices.

RIPARIAN

Stream Communities

Within the Buffalo Allotment, all streams are mainly dominated by woody riparian species. The majority of the canyons in Buffalo Allotment were severely affected by floods in 1983 and 1984. The riparian areas in these canyons have recovered significantly (USDA Forest Service 1993a).

Andorno Creek and Fall Canyon Creek are in satisfactory and improving condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Both steams are well armored with rock and woody vegetation; streambank stability is excellent (USDA Forest Service 2006). There are locations along streams where cattle grazing have historically and may continue to impact vegetation conditions (USDA Forest Service 1993a). Some willows on the allotment have a mushroom shape as a result of grazing pressure. Areas where riparian concerns may exist include sites along Chimney Creek and in Porcupine Canyon.

A condition assessment for cottonwood was done in Falls Creek in 2002 using the Matrices. The study found the site to be non-functioning due to undesirable species in the herbaceous understory and shallow rooting depth. The study was done in an area that is also impacted by dispersed camping, and the results are not indicative of the condition of the cottonwood that are away from the dispersed camping area. In general, the cottonwood are considered to be functioning-at-risk.

Seeps, Springs and Meadows

Seeps, springs, and meadow complexes are primarily located in the headwaters of each of the drainages within the Buffalo Allotment. These vegetative communities were severely impacted by historical grazing practices on this allotment. Specific problems have been documented in Singas Peak meadow (USDA Forest Service 2003b). It is believed that seeps, springs, meadows are improving; however, the speed of recovery since the changes in management during the early 1990s is not well known. These areas are very important communities that can be challenging to manage under a livestock grazing program. Past management practices, such as placing water developments too close to springs and exclosure fences that are too small, have prevented many of these sites from fully recovering.

ASPEN

Within this allotment, aspen are on a distinct upward trend. The stands have a diverse age class and are expanding throughout the allotment (2,926 acres are dominated by aspen, Table 27). Historic grazing practices have impacted some individual stands; however, these stands are generally small and located in areas where cattle concentrate. Significant changes in management and livestock numbers occurred during the early 1990s. This change is believed to have improved conditions in numerous vegetative communities including aspen (USDA Forest Service 2003).

Photo 5. Flood Event Shows Scaring and Loss of Vegetation within Horse Creek (1983).

Photo 6. Horse Creek Further Down the Drainage from Photo 5, but Showing the Recovery of the Vegetation along this Stream (2001).

UPLANDS

Sagebrush

These communities make up a large portion of the vegetation classes (83%, Table 27) managed on the Buffalo Allotment and include communities dominated by mountain big sagebrush (5,764 acres), Wyoming big sagebrush (1,701 acres) low sage (1,443 acres), and basin big sagebrush (97 acres). The 1962 Range Analysis for the Buffalo Allotment showed that out of the 3,400 acres suitable for grazing 1) none were in good condition, 2) 565 acres were considered fair, 3) 1,788 were in poor condition, and 4) 513 were in very poor condition (USDA Forest Service 1993, Map 5). In 1993, improvement had been documented on the upper Buffalo Canyon with 55 percent of the area meeting Forest Plan desired conditions (USDA Natural Resources Conservation Service 2002). In areas not meeting Forest Plan desired conditions, shrubs dominated with grasses at 20 percent of the species compositions instead of 50-65 percent as defined by the potential natural community. Large fires have occurred resulting in 3,327 acres of upland grasslands. Additional large fires occurred in 2004 and 2006. For the upland grasslands, 52 percent of the acres are below 6,700 feet indicating some risk to invasion of cheatgrass. Cheatgrass has been documented as a dominate species in Horse Canyon and invading sagebrush in Buffalo Canyon since 1952 and other low elevation habitats (USDA Forest Service 2003a).

Curl-leaf Mountain Mahogany

Mountain mahogany stands have remained relatively stable on the Buffalo Allotment. These stands represent a very small percentage of the total vegetative communities, 977 acres or 5 percent of the allotment. Mountain mahogany stands occur on steep, rocky hill slopes and ridges. They are not believed to have been noticeably impacted by cattle grazing in the recent past due to their locations.

Mountain Brush

This community includes mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities are very diverse, make up a large portion of the vegetative communities, and occur throughout the allotment (3,974 acres or 20 percent). These mountain brush communities occur at higher elevation and moist sites, and are dominated by snowberry and other species. These sites are generally healthy communities.

NOXIOUS WEEDS

Noxious weed infestations appear to be limited to Scotch thistle within the Buffalo Allotment (62 acres, Table 28). However, the rugged nature of this allotment and large acreages of wilderness have resulted in limited inventories for noxious weeds. Noxious weed treatments appear to be effective at controlling and minimizing infestations on this allotment.

Buttermilk Allotment

The Buttermilk Allotment includes large portions of the headwaters of the Martin Creek Watershed and other smaller watersheds. The Buttermilk Allotment is characterized by steep rugged mountain terrain and open basins of sagebrush. The Buttermilk Allotment includes a wide range of riparian habitats and is one of the most diverse allotments in the project area. The

dominant streams within the Buttermilk Allotment include Martin, Round Corral, Deep, Alkali, Road Canyon, Lye, Dutch John, and Buttermilk creeks. At the lower elevations, streams are generally characterized as being lower gradient meandering streams scattered throughout the valley bottoms. At higher elevations the streams are steep gradient dominated by willow and aspen communities. Springs, seeps, and large meadows (e.g., Buttermilk Meadows) are common in this allotment and provide important habitat for wildlife species such as sage grouse, mule deer, neotropical migratory birds, and other species.

The dominant vegetation community in this allotment is mountain big sagebrush; however, there is a strong diversity of vegetative communities within this allotment. Other important vegetative communities within the Buttermilk Allotment include large stands of aspen, mountain mahogany, riparian and mountain brush, with important areas of low sagebrush and Wyoming big sagebrush.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, the uplands, aspen, and riparian vegetation communities are functioning. Riparian areas in the Blackridge and Spring City Pastures are functioning-at-risk due to degraded conditions in the meadow systems. In the Spring City Pasture, uplands are also functioning-at-risk due to cheatgrass dominance in the understory of the Wyoming big sagebrush and mountain brush communities.

Using 15 photos that were taken within Buttermilk Allotment, a total of 95 comparative classes were evaluated. Repeat photos were taken at a variety of intervals from 13 to 50 years. Most of the vegetation classes increased or had no change from the original photo, except for sagebrush which decreased in size or density in 20 percent of the photo pairs (Table 32). Mountain big sagebrush has likely decreased in this allotment due to prescribed fire and stands dying off due to decadency.

Table 32. Summary of Total Percent of Vegetation Changes within each Comparison Class within the Buttermilk Allotment (15 repeat photos over 95 comparison classes).

VEGETATION TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	7%	21%	71%
Sagebrush	20%	47%	33%
Mountain Brush	0%	36%	64%
Aspen	0%	0%	100%
Mahogany	0%	20%	80%
Woody Riparian	0%	20%	80%
Plant Cover	7%	53%	40%

RIPARIAN

Stream Communities

Within the Buttermilk Allotment, streams that are dominated by woody riparian species are generally functioning to functioning-at-risk but improving in condition. The repeat photo analysis showed that 80 percent of woody riparian was increasing while 20 percent of the photo pairs showed no change (Table 32). Streams in the Buttermilk Pasture (Alkali, Deep, and Round Corral creeks) and Lye Creek Pasture (Lye, Middle Fork of Dutch John, and Road creeks) are in

satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). In the Blackridge Pasture, the lower reach of the Martin Creek and a small portion of Round Corral Creek are in satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Although willows on this Blackridge Pasture are generally healthy, the understory within some of these communities continues to be of concern due to lack of desirable forbs and graminoids, impacts to the streambank, and erosion concerns. Areas where riparian concerns exist include sites along Alkali, Buttermilk, and Round Corral creeks in specific locations usually at the lower reaches on the Forest.

Seeps, Springs and Meadows

Although some of these areas are functioning as desired, most are functioning-at-risk and non-functioning due to sagebrush encroachment, noxious weeds, soil compaction, bare ground, and a lack of a desired plant composition. These communities are widespread within the Spring City, Buttermilk, and Lye Creek pastures on the Buttermilk Allotment. The Blackridge Pasture contains limited numbers of springs and seeps. These communities tend to be small and make up only a very small percentage of the total area within this allotment. These areas are, however, very important communities that can be challenging to manage under a livestock grazing program. Past management practices, such as placing water developments too close to springs and exclosure fences that are too small, have prevented many of these sites from fully recovering. Specific issues with the meadow systems in the Blackridge Pasture include increased bare ground and an increase in sagebrush and undesirable forbs.

Buttermilk Meadows is one of the largest meadow complexes on the District and is within the Buttermilk Allotment. These meadows are included within a large exclosure, and livestock grazing is not authorized in the area (Photo 7). Serious non-compliance issues have occurred in the past within Buttermilk Meadows. Recent management actions, including four years of rest, have corrected these problems. A condition assessment for the Spring City area was done using the Matrices (Table 33). Meadows in the Spring City area are non-functioning to functioning-at-risk due to soil compaction and invasion of shrub species. Restoration of the water table would probably be necessary to recover this meadow.

Table 33. Data for the Buttermilk Allotment[9].

PLOT CODE	STUDY NAME	DATE	VEGETATION TYPE	CONDITION	PERCENT BARE GROUND (Functioning <5%)
21963	Spring City	2001	Dry-to-Moist Meadow	Non-functioning	22%
95804	Lye Creek 1	1995	Aspen	Functioning-at-Risk	3%
95805	Lye Creek 2	1995	Aspen	Functioning-at-Risk	7%
95810	Road Creek 1	1995	Aspen	Functioning-at-Risk	1%

[9] **(**Collected for development of ecological scorecards and analyzed with criteria set up by the Matrices (Appendix A). Individual study data can be viewed in the project record.)

ASPEN

Within this allotment, aspen is currently in a functioning condition and on an upward trend. The stands have a diverse age class and are expanding throughout the allotment. While the majority of the aspen are healthy and achieving agency objectives, some stands are at risk and stressed due to fungus, insects, and disease (Guyon 2006). Past grazing practices have impacted some individual stands that are currently at functioning-at-risk; however, these stands are generally small in size and located in areas where cattle tend to concentrate. Data on soil and vegetation characteristics gathered in 1995 was evaluated using the Matrices. Aspen stands in Lye Creek and Road Creek were functioning-at-risk due mainly to undesirable species in the understory (Table 33). Repeat photo comparisons on the Buttermilk Allotment indicate that 100 percent of the aspen sites are increasing in the photo pairs evaluated. Most stands on the Buttermilk Allotment are actively regenerating with sufficient young aspen to ensure long-term sustainability of aspen communities on the allotment. Reduced grazing intensity and extended rest for the past several years has contributed to the health and recovery of aspen stands within the Buttermilk and Lye Creek Pastures.

UPLANDS

Sagebrush

These communities make up the largest acreages (65%) of any vegetation class managed on the Buttermilk Allotment. This vegetation class is dominated by the following species: mountain big sagebrush (10,081), low sagebrush (5,890 acres), Wyoming big sagebrush (4,205 acres), and basin big sage (235). Due to successful fire suppression and the influence of historic grazing practices, the sagebrush communities lack a diversity of age classes. Some stands have lost their natural mosaic pattern (Howard 1999) but retain a healthy understory. Vegetation projects (e.g., prescribed fire) have been implemented within this allotment to replicate natural fire patterns setting some portions of these sites back to post-fire vegetation communities. Concerns were expressed that treatments may increase the rabbitbrush component in these communities. Monitoring has shown that rabbitbrush has remained a constant within and outside the treatment areas.

Sagebrush communities within this allotment tend to be mature stands and are generally in a static trend. A comparison of the photo sets in Table 32 shows that approximately 33 percent of the photo pairs indicated sagebrush was increasing, 47 percent showed no change, and 20 percent were decreasing. Of the 20 range trend analyses, only two of the studies had an apparent upward trend for vegetation and soil, the remaining 18 studies were stable or had an apparent downward trend for vegetation and soil. However, all but one study occurred before 1990 and may not represent current condition. Although all attributes in the Matrices cannot be evaluated with this data to determine condition, bare ground was functioning (< 20%) for 13 of the 20 studies. Buttermilk Meadows is a large exclosure where data was collected (fenceline was installed in 2003). This exclosure has had problems with unauthorized livestock being grazed within it and can be comparable to a grazed unit. In 2006, the percent bare ground was 6 percent (functioning is <20% as defined in the Matrices). The apparent trend for vegetation and soil were stable, but the condition was not determined.

The range trend studies in the Spring City Pasture indicate downward apparent trend in 1980 and 1988. The current condition was determined to be functioning-at-risk due to cheatgrass invasion

into Wyoming big sagebrush. Mountain brush (bitterbrush component) is decadent with an understory of cheatgrass.

Photo 7. 2006 Fenceline Contrast of Round Corral Exclosure and the Buttermilk Pasture on the Buttermilk Allotment.
(The photo is from the Buttermilk Pasture into the exclosure.)

Mountain Mahogany

These stands have increased in size and structure on the Buttermilk Allotment (1,974 acres, Table 27). Due to the lack of fire, mountain mahogany stands are expanding and have encroached upon other vegetation communities including sagebrush and mountain brush. Cattle grazing on this allotment may impact a few very small mountain mahogany stands when located near areas where cattle concentrate. Most mountain mahogany stands on the allotment are characterized by a core of mature trees surrounded by a band of young trees expanding into other vegetative communities. Photo comparisons on the Buttermilk Allotment indicate that 80 percent of the photo pairs compared for mountain mahogany are increasing and 20 percent showed no change.

Mountain Brush

Mountain brush communities are very diverse and occur throughout the allotment (3,698 acres, Table 27). On higher elevation mountain slopes, mountain brush communities dominated by snowberry and other species are generally healthy and have increased substantially. Within lower and mid-elevation communities, mountain brush is dominated by bitterbrush which generally lacks a diversity of age classes. These communities are dominated by mature plants. Photo comparison shows that approximately 36 percent of the classes evaluated showed no change while 64 percent were increasing in size and density. The primary concern on the Buttermilk Allotment for this vegetation community is in the Spring City Pasture. In this pasture some large stands of bitterbrush are very old and becoming decadent. The understory of these stands has an increasing component of cheatgrass. These areas are at risk of fire and ultimately conversion to cheatgrass.

NOXIOUS WEEDS

Noxious weed infestations are relatively limited within the Buttermilk Allotment (48 acres, Table 28). Noxious weeds known to occur on the Buttermilk Allotment include Scotch thistle, hoary cress, Russian knapweed, leafy spurge, Canada thistle, and yellow toadflax. Bull thistle, an invasive species, is also present. Noxious weed infestations on the Buttermilk Allotment are located in small isolated pockets and generally do not appear to be increasing in size. Hoary cress is found along many roadsides and may be expanding along these roads. Recent treatments have focused on controlling and reducing the spread of this species. The presence of small patches of Russian knapweed, leafy spurge, Canada thistle, and yellow toadflax are of particular concern on this allotment. These areas are being aggressively treated to eliminate infestations. Noxious weed treatments appear to be effective at controlling and minimizing infestations on this allotment.

Granite Peak Allotment

The Granite Peak Allotment is characterized by steep rugged mountain terrain with some open basins of sagebrush. The allotment is dissected by an abundance of small drainages. The Granite Peak Allotment includes a wide range of riparian habitats. Streams are generally steep gradient dominated by willow and to a lesser extent aspen communities. Spring, seeps, and large meadows are common in this allotment and provide important habitat for wildlife species. The dominant streams within the Granite Peak Allotment include Willow, Solid Silver, Cottonwood, Mullinix, Indian, and South Fork Indian creeks.

This allotment is dominated by mountain big sagebrush communities (Table 27). The Granite Peak Allotment has a strong mix of numerous important vegetative communities which include mountain shrub, montane grasslands (grasslands created by large wildfires) and upland meadows, large stands of aspen, Wyoming big sagebrush, and low sage.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, the uplands and aspen vegetation communities are functioning with specific issues related to upland recovery after fire and the introduction of cheatgrass in the Lower Indian Creek, Lower Willow Creek, and Tom Basin. The riparian areas are functioning to functioning-at-risk. The riparian systems (both woody streams and meadows) have been impacted by fire and are functioning-at-risk due to undesirable species in the understory and condition of the willows (Lower and Upper Willow Creek Pasture). The Upper Indian Creek and Solid Silver Pasture are functioning although there are issues with specific meadows systems in these two pastures. The Lower Indian Creek was functioning-at-risk for the riparian systems due to herbaceous species composition.

Using 9 photos that were taken within the Granite Peak Allotment, 48 comparative classes were evaluated. Repeat photos were taken at a variety of intervals from 33 to 85 years. All classes compared within this allotment show increasing size or density of the vegetation (Table 34). Evaluation of repeat photos indicated reduced erosion and increased plant cover at most sites leading to better protected soils.

Table 34. Summary of Total Percent of Vegetation Changes in each Comparison Class within the Granite Peak Allotment (9 repeat photos over 48 comparison classes).

VEGETATION TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	0%	25%	75%
Sagebrush	0%	44%	56%
Mountain Brush	0%	17%	83%
Aspen	0%	0%	100%
Plant Cover	0%	11%	89%

RIPARIAN

Stream Communities

Within the Granite Peak Allotment, streams dominated by woody riparian species are generally in a functioning condition although some areas are functioning-at-risk. South Fork of Indian Creek (Upper Indian Creek Pasture) is in satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Properly functioning condition (PFC) assessments concluded that all four reaches were in properly functioning condition and in an upward trend (USDA Forest Service 2006). Condition assessment using the Matrices determined the condition as functioning on the South Fork of Indian Creek (Table 35). Mullinex Creek (Solid Silver Pasture) and Indian Creek (Lower Indian Creek Pasture) were in satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Although the willow component appears in good condition, the condition was determined to be functioning-at-risk based on site visits. Graminoid and forb communities within these sites are improving, but may be functioning-at-risk due to lack of desirable forbs, graminoids, and some streambank and erosion concerns. The riparian areas in the Lower Willow Creek and Upper Willow Creek Pastures were determined to be functioning-at-risk. Large areas of riparian vegetation were burned in the Upper Willow Fire. Unauthorized livestock use has occurred on the Lower Willow Creek Pasture.

Condition assessment of Indian Creek showed the cottonwood stand to be functioning-at-risk in 2002. The cottonwood stands also appear to lack recruitment of cottonwood. Indian Creek has small stands of cottonwoods that generally have a mixture of all age classes of trees. This assessment was done in an area that is also impacted by dispersed camping. Current conditions indicate that the stands are showing more recruitment.

Table 35. Data for the Granite Peak Allotment[10].

PLOT CODE	STUDY UNIT	STUDY NAME	DATE	VEGETATION TYPE	CONDITION
USFS 2006	Upper Indian Creek Pasture	South Fork of Indian Creek	2006	Stream	Functioning
21971	Upper Indian Creek Pasture	Granite Meadow	2001	Dry-to-Moist Meadow	Functioning-at-Risk
22986	Solid Silver Pasture	Solid Silver Creek	2002	Dry-to-Moist Meadow	Functioning-at-Risk
22985	Lower Indian Creek Pasture	Indian Creek	2002	Cottonwood	Functioning-at-Risk

Seeps, Springs and Meadows

These communities are widespread within the Upper Indian, Solid Silver, and Upper Willow Creek Pastures on the Granite Peak Allotment. The Tom Basin, Lower Indian, and Lower Willow Creek Pastures contain limited numbers of springs and seeps. These communities tend to be small and make up only a very small percentage of the total area within this allotment. Although some of these areas are functioning as desired, most are functioning-at-risk due to sagebrush encroachment, noxious weeds, soil compaction, bare ground, and a lack of a desired plant composition. Past management practices, such as placing water developments too close to springs and exclosure fences that are too small, have prevented many of these sites from fully recovering. Condition assessments were completed for meadows in Granite Meadow (Upper Indian Pasture) and Solid Silver Creek (Solid Silver Pasture) (Table 35). The meadows within Granite Meadow were determined to be functioning-at-risk due to undesirable forb species and hummocks. An area of particular concern is along the pasture boundary between the Upper Indian Pasture and Upper Willow Creek Pasture. A series of small springs and meadows in this area are of concern due to poorly placed water developments and a lack of boundary fencing. Also in the Upper Indian Pasture, the meadows at the headwaters of the South Fork of the Indian Creek are functioning-at-risk due to drying, compaction, and poor species composition, and are at risk for head-cutting (USDA Forest Service 2006). Issues have also been documented in the high elevation meadows where the South Fork enters the Main Fork of Indian Creek (USDA Forest Service 2006).

ASPEN

Within this allotment, aspen are in a functioning condition and upward trend (occurs on 3,378 acres, 9% of the allotment (Photo 8 and 9)). The stands have a diverse age class and are expanding throughout the allotment (USDA Forest Service 2006). While the majority of the aspen are healthy and achieving agency objectives, some stands are stressed due to fungus, insects, and disease (Guyon 2006). Past grazing practices have impacted some individual stands; however, these stands are generally small and located in areas where cattle concentrate. In the Lower Indian Creek Pasture, these stands are typically smaller and at the lower elevations for aspen. Based on site visits, condition was determined to be functioning-at-risk due to the lack of

[10] (Data collected from a variety of sources and analyzed with criteria set up by the Matrices. Individual study data can be viewed in the project record.)

recruitment and species composition in the understory (increased species cover indicating management problems). One area of concern is in the headwaters of the South Fork of Indian Creek where the pastures are not well separated and livestock congregate for long periods during the grazing season (USDA Forest Service 2006). This area has experienced a decrease in the native perennial vegetation within the understory of the aspen.

In 2001, the Upper Willow Fire burned a significant number of aspen stands within the Granite Peak Allotment. Site visits to these stands have shown significant regeneration and recovery of the aspen stands. Most aspen stands on the Granite Peak Allotment are actively regenerating with sufficient young aspen to ensure long-term sustainability of aspen communities on the allotment.

UPLANDS

Sagebrush

Sagebrush communities make up the largest acreages of any vegetation class (61%) managed on the Granite Peak Allotment. This vegetation class is dominated by the following species: mountain big sagebrush (15,434 acres), Wyoming big sagebrush (2,827 acres), low sage (2,654 acres), and basin big sagebrush (734 acres). Due to successful fire suppression and the influence of historic grazing practices, sagebrush communities within portions of the Tom Basin, Lower Indian, Upper Indian, and Solid Silver pastures lack a diversity of age classes. Some of these stands have lost their natural mosaic pattern (Howard 1999).

One trend study completed in the sagebrush vegetation type from 1954 to 1987 showed an upward trend (Table 36). There was a significant decrease in bare ground (from 43 to 4 percent (Table 36)) which is below the 20 percent for functioning condition (Appendix A). Grasses significantly increased while forbs decreased indicating an improved condition (Table 36, Photo 8 and 9). Another indication this site is moving in an upward trend is the increase in grasses which include thickspike wheatgrass, bluebunch wheatgrass, and squirreltail. Species with a high resource value rating have not significantly changed.

Lower Willow Creek and Lower Indian Creek pastures were determined to be functioning-at-risk while the Tom Basin Pasture was non-functioning due to fire. The Upper Willow Fire in the Lower Willow Creek and Lower Indian Creek pastures burned large acreages of sagebrush habitats with little to no mosaic pattern. Higher elevations have begun to recover with an abundance of native grasses (Upper Willow Creek Pasture). Lower elevation sagebrush stands particularly within the Lower Willow Creek pasture have recovered more slowly, primarily due to drought conditions and the effects of cheatgrass invasion. The Tom Basin Pasture occurs mostly on south facing slopes and was invaded by cheatgrass after fire burned over half of the allotment, especially in the Wyoming big sagebrush dominated communities. Tom Basin Pasture is at high risk to invasion of medusahead found on adjacent lands. Medusahead will replace cheatgrass in the understory.

Table 36. **Granite Peak Allotment Trend Data** (from transect cluster studies, percent frequency and ground cover data. See Vegetation Specialist Report for details).

YEAR	1954	1959	1979	1987	SIGNIFICANT CHANGES BETWEEN 1954 and 1987
Vegetation Type (Percent Frequency)					
Grasses	21.4	28.6	39.1	42.9	Increasing
Forbs	78.6	66.7	53.1	54.5	Decreasing
Shrubs	0.0	4.8	7.8	1.1	No change
Trees	0.0	5.0	0.0	0.5	No change
Ground Cover (Percent Cover)					
Vegetation	7.0	10.8	31.3	83.8	Increasing
Litter	48.0	57.8	49.5	12.6	Decreasing
Rock	2.0	1.0	1.0	0.0	No change
Pavement	0.0	0.0	8.1	0.0	No change
Soil	43.0	30.4	10.1	3.6	Decreasing

Photo 8. 1954 Photo taken within Study 505, Granite Peak Allotment Showing the Initial Condition.
(Note the herbaceous forbs and aspen stand.)

Photo 9. 1987 Photo from Same Area as Photo 8 shows Significant Increase in Grasses and Decrease in Forbs.
(Note the diverse age classes and regeneration of aspen.)

Mountain Mahogany

These stands have increased in size and structure on the Granite Peak Allotment. Due to the lack of fire, mountain mahogany stands are expanding and have encroached upon other vegetation communities including sagebrush and mountain brush. Cattle grazing on this allotment may impact a few very small mountain mahogany stands when they are located near areas where cattle concentrate. Most mountain mahogany stands on the allotment are characterized by a core of mature trees surrounded by a band of young trees expanding into other vegetative communities.

Mountain Brush

This community includes mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities are very diverse and occur throughout the allotment. On higher elevation mountain slopes, mountain brush communities dominated by snowberry and other species are generally healthy and have increased substantially. Within lower and mid-elevation communities, mountain brush is dominated by bitterbrush which generally lacks a diversity of age classes. Together both vegetation types occur on about 6,312 acres. These communities are dominated by mature and over-mature plants. A comparison of the photo sets found that approximately 83 percent of the photos compared showed increased size or density of mountain brush classes while 17 percent of the photos showed no change. For this vegetation community, the primary concern on the Granite Peak Allotment is the Lower Indian Creek Pasture. In this pasture, some large stands of bitterbrush are very old and becoming decadent. These areas are at risk of fire and ultimately conversion to cheatgrass, which is increasing in the understory. The Tom Basin Pasture has been impacted by fire. The steep, south facing slopes have been invaded by cheatgrass.

NOXIOUS WEEDS

Noxious weeds known to occur on the allotment include Scotch thistle, hoary cress, Russian knapweed, leafy spurge, and Canada thistle (54 acres, Table 28). Bull thistle, an invasive species, is also present. Medusahead occurs on BLM and private lands adjacent to the Granite Peak Allotment. Medusahead infestations are believed to occur on this allotment; however, the current status is not known. Scotch thistle infestations within the Willow Creek drainage are larger in size and have expanded over the past several years. Aggressive treatments were implemented in 2008 and will continue into the 2009 field season. The presence of small patches of Russian knapweed, leafy spurge, and Canada thistle are of particular concern on this allotment. These areas are being aggressively treated to eliminate the infestations. The presence of large infestations of medusahead in Paradise Valley is a significant risk to the vegetative resources on the Granite Peak Allotment and the Santa Rosa Ranger District. Noxious weed treatments appear to be effective at controlling and minimizing infestations on this allotment.

Indian Allotment

Streams on the Indian Allotment are generally characterized as lower gradient meandering streams located in large canyons with high bluffs above the drainages. The Indian Allotment includes large portions of the South Fork of the Quinn River, all of Jakes Creek, and to a lesser extent, portions of the East Fork of the Quinn River. The allotment is very rugged, and the

streams are dominated by willow with numerous beaver ponds both historic and active. Spring, seeps, and meadows are uncommon in this allotment but are very important to wildlife species.

The dominant vegetation community is mountain big sagebrush; however, these areas have been severely impacted by repeated large-scale catastrophic fires. The most recent wildfire occurred in 2005 and burned almost the entire South Fork of the Quinn River Watershed. Other vegetative communities within the Indian Allotment include Wyoming big sagebrush, low sage, mountain grasslands (from fires in uplands), mountain brush, and small stands of aspen. Unauthorized grazing is a serious problem on the Indian Allotment. Unauthorized horses and cattle drift onto the Forest from the adjacent Fort McDermitt Paiute-Shoshone Reservation. The persistence of trespass livestock on the allotment has resulted in numerous resource impacts.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, the uplands and aspen vegetation communities are functioning while the riparian areas are functioning-at-risk. The riparian areas are functioning-at-risk for both woody stem vegetation and meadow systems due to extensive fires and unauthorized use. Sagebrush communities have experienced multiple large-scale catastrophic fires over the past 30 years. These fires have increased the cheatgrass component within the allotment and eliminated much of the sagebrush seed source particularly in the North Pasture. The uplands in the North Pasture are functioning-at-risk due to the type conversion of sagebrush communities. Both noxious weeds and year round unauthorized livestock are a serious problem.

RIPARIAN

Stream Communities

The willow riparian communities within this allotment are functioning-at-risk. Jakes Creek (South Pasture), East Fork of the Quinn River (North Pasture), and South Fork of the Quinn River (North Pasture) are in a unsatisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Although willows have increased along streams, the condition of the streams and the understory vegetation have not noticeably improved. Problems along the streams in this allotment are a direct result of year round unauthorized livestock use and repeated wildfires.

For the South Fork of the Quinn River, the condition has improved (Photo 10 and 11). Comparison of these photographs shows willows are increasing, cut banks are recovering, and erosion has dramatically decreased. There has also been deposition of soil on the rock bars as seen in the 1977 photo (Photo 10). One concern from the photos is the lack of carex and sedges along the river. The soil deposition has also been influenced by several beaver dams observed in the area.

Photo 10. **South Fork of the Quinn River** (1977 photo shows a lack in riparian woody species).

Photo 11. 2007 photo of South Fork of the Quinn River.
(Repeat of Photo 10 shows an increase in riparian woody species, recovering cut banks, and dramatically decreased erosion.)

Seeps, Springs and Meadows

These communities are limited within both pastures on the Indian Allotment. There are a few isolated seeps and springs within the South Pasture on the allotment. These communities tend to be small and make up a very small percentage of the total area within this allotment. A condition assessment for a meadow on the East Fork of Quinn (North Pasture) determined the area to be functioning-at-risk (Table 37). The condition was functioning-at-risk due to the degraded soil condition and undesirable forb species in the understory. These areas are important communities that can be challenging to manage under a livestock grazing program. Although some of the seeps, springs, and meadows are functioning as desired, most are functioning-at-risk due to noxious weeds, soil compaction, bare ground, and a lack of a desired plant composition. Past management practices such as placing water developments too close to springs, wildfires and unauthorized livestock use have prevented many of these sites from fully recovering.

Table 37. Data for the Indian Creek Allotment[11].

PLOT CODE	STUDY NAME AND UNIT	DATE	VEGETATION TYPE	CONDITION	PERCENT BAREGROUND (Functioning <5%)
99935	Devil's Gate 1 (North Pasture on East Fork of Quinn)	1999	Dry-to-Moist Meadow	Functioning-at-Risk	1%

ASPEN

Within this allotment, the aspen stands are limited in size and acres (330 acres or 2% of allotment, Table 27). Aspen stands on the allotment are located in the headwaters of Jakes Creek and the South Fork of the Quinn River. Although the aspen has been impacted by past wildfires, the stands are on an upward trend with significant regeneration. On May 7, 2007, District employees conducted reviews of the Indian Allotment to address issues with unauthorized horses. During these site visits a visual review of aspen communities was conducted. Many of these stands have been previously burned. Regeneration is abundant, and there was no sign that livestock grazing is affecting the long-term stability of these stands. The suckers in the stands that have previously burned ranged in height from approximately 5 feet to over 16 feet tall.

UPLANDS

Sagebrush

These communities make up the largest acreages of any vegetation class managed on the Indian Allotment (88% of allotment, Table 27). A variety of sagebrush communities occur in the Indian Allotment: mountain big sagebrush (9,641 acres), Wyoming big sagebrush (4,637 acres), low sage (1,194 acres), and basin big sagebrush (498 acres). Sagebrush communities have experienced multiple large-scale catastrophic fires over the past 30 years. The uplands in the North Pasture are functioning-at-risk due to the type conversion of sagebrush communities. These fires have increased the cheatgrass component within the allotment and eliminated much of the sagebrush seed source particularly in the North Pasture. Both noxious weeds and year round unauthorized livestock are a serious problem. Other associated impacts may include the loss of soils following fires.

Multiple site analysis studies and ocular analysis studies have been conducted throughout the allotment (Vegetation Specialist Report and project record). These studies give a snapshot of the rangeland at that point in time in relation to vegetation and soil health. In 1976, 24 site analyses were conducted; the apparent vegetation and soil trend was rated as stable. The exception was two site analyses conducted on the east side of the Quinn River which rated both vegetation and soil apparent trend as downward. Percent bare ground ranged from a high of 53 percent to a low of 2 percent. In 1987, 12 studies using ocular analyses were conducted throughout the Indian

[11] (Collected for development of ecological scorecards and analyzed with criteria set up by the Matrices. Individual study data can be viewed in the project record.)

Allotment. The apparent vegetation and soil trend rated as stable across the allotment. Percent bare ground ranged from a high of 37 percent to a low of 10 percent. Observations during visits to the Indian Allotment in 2006 and 2007 by the District Range Management Specialist indicate the current vegetation trend of the uplands is stable with riparian vegetation stable to upward trend.

Curl-leaf Mountain Mahogany

Small stands of mountain mahogany occur within this allotment (140 acres, Table 27). Observations made of these communities by the District Natural Resource Officer concluded they are healthy but static.

Mountain Brush

This community includes mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities are limited within this allotment and have been affected by multiple wildfires (544 acres or 3% of the allotment, Table 27). Mountain brush communities have responded more favorably to wildfires, are generally healthy, and have increased substantially.

NOXIOUS WEEDS

Noxious weed infestations are of great concern within the Indian Allotment (97 acres, Table 28). Noxious weeds known to currently occur on the Indian Allotment include Scotch thistle, hoary cress, Russian knapweed (not mapped), and Canada thistle. Bull thistle, an invasive species, is also present. Medusahead is believed to occur on reservation lands adjacent to the allotment. Large-scale fires and grazing by unauthorized horses from adjacent reservation lands are contributing to the noxious weed problems on this allotment. Noxious weed infestations on the Indian Allotment are generally larger in size and appear to be expanding in the case of both Canada and Scotch thistle. Aggressive treatments have occurred over the past several years and will continue into the 2009 field season. The presence of large infestations of numerous weed species on reservation, BLM, and private lands in the adjacent valley is a significant risk to the vegetative resources on the Indian Allotment. This allotment has one of the most serious noxious weed problems of all of the allotments on the Santa Rosa Ranger District.

Martin Basin Allotment

The Martin Basin Allotment includes large portions of the headwaters of the Martin Creek Watershed and to a lesser extent, the headwaters of the North Fork of the Little Humboldt River. The Martin Basin Allotment includes a wide range of riparian habitats. At the lower elevations, streams are generally low gradient meandering streams scattered throughout the valley bottoms. At higher elevations the streams are steep gradient dominated by willow and aspen communities. Spring, seeps, and meadows are common in this allotment and provide important habitat for wildlife species such as sage grouse, mule deer, neo-tropical migratory birds, and other species. Major streams within this allotment include Martin Creek, Cabin Creek, Dutch John Creek, Siard Creek, and the North Fork of the Little Humboldt River.

The dominant vegetation community in this allotment is mountain big sagebrush. Other important vegetative communities within the Martin Basin Allotment include large stands of

aspen, mountain mahogany, low sagebrush, other sagebrush communities, riparian, and mountain brush.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

Generally, uplands are functioning except for lower elevation sagebrush with cheatgrass in the understory except in the Long Valley Pasture. Riparian condition varies from functioning to non-functioning depending on the pasture. Many streams were in unsatisfactory condition. Meadows are generally functioning-at-risk and the understory communities in riparian woody communities (willow dominated) contain many undesirable species.

Using 15 photos that were taken within the Martin Basin Allotment, 63 comparative classes were evaluated. Repeat photos were taken at a variety of intervals from 15 to 85 years. All classes compared within this allotment show increasing size or density (Table 38).

Table 38. Summary of Total Percent of Vegetation Changes within each Comparison Class within the Martin Basin Allotment (15 repeat photos over 63 comparison classes).

VEGETATION TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	14%	57%	29%
Sagebrush	7%	53%	40%
Mountain Brush	0%	10%	90%
Aspen	0%	33%	67%
Mahogany	0%	0%	100%
Plant Cover	20%	40%	40%

RIPARIAN

Stream Communities

Riparian vegetation (woody and herbaceous dominated) is generally showing an upward trend but are still considered to be functioning-at-risk. Martin Creek (Siard Pasture), Cabin Creek (Cabin Creek Pasture), North Fork of Dutch John Creek (Cabin Creek Pasture) are in satisfactory condition and generally improving (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Long Canyon Creek (North Fork Pasture), North Fork of the Little Humboldt River (Cabin Creek Riparian Pasture, North Fork Pasture), North Fork Cabin Creek, Siard Creek (Siard Pasture) were in unsatisfactory condition using the GAWS data There are locations along streams where cattle grazing has historically and may currently be impacting vegetation conditions. Some willows on the allotment have a mushroom shape as a result of grazing pressure. Although willows on this allotment are generally healthy, the understory within these communities is of concern. Graminoid and forb communities within these sites are improving, but functioning-at-risk due to lack of desirable forbs, graminoids, and some streambank and erosion concerns. Areas where riparian concerns exist include sites along Cabin Creek, North Fork Cabin Creek, Siard Creek, Martin Creek, and the North Fork of the Little Humboldt River.

Seeps, Springs, and Meadows

Seeps, springs, and meadows vegetation are widespread within the Cabin Creek, Siard, North Fork, and Cold Springs pastures on the Martin Basin Allotment. The Long Valley and Black Ridge pastures contain only a limited number of springs and seeps. These communities tend to be small and make up only a very small percentage of the total area of this allotment. These areas are, however, very important communities that can be challenging to manage under a livestock grazing program.

Although some of the seeps, springs, and meadow areas are functioning as desired, most are currently functioning-at-risk due to sagebrush encroachment, noxious weeds, soil compaction, bare ground, and a lack of a desired plant composition. Condition assessments using the Matrices (Appendix A) for dry-to-moist meadows in the area of North Fork of Cabin Creek (2001), Siard Creek Meadow (2003), Cabin Creek (2 plots - 1995), and a wet meadow in Martin Creek (2003) showed that the evaluated meadows were functioning-at-risk (Table 39). Past management practices, such as placing water developments too close to springs and exclosure fences that are too small, have prevented many of these sites from fully recovering from past changes in livestock management. Repeated condition assessments (2001 and 2007) conducted on Cabin Creek (see Vegetation Specialist Report) indicate that although there are still concerns which include vegetation species composition and the presence of hummocks, the trend of the various attributes is upward (Table 39). There was a significant reduction in percent bare ground.

Table 39. Data for the Martin Basin Allotment[12].

PLOT CODE	UNIT	STUDY NAME	DATE	VEGETATION TYPE	CONDITION
21964	Cabin Creek	NF Cabin Creek	2001	Dry-to-Moist Meadow	Functioning-at-Risk
			2007		Functioning-at-Risk
23004	Siard	Martin Creek	2003	Wet Meadow	Functioning-at-Risk
23005	Siard	Siard Creek Meadow	2003	Dry-to-Moist Meadow	Functioning-at-Risk
95800	Cabin Creek	Cabin Creek 1A	1995	Dry-to-Moist Meadow	Functioning-at-Risk
95801	Cabin Creek	Cabin Creek 1B	1995	Dry-to-Moist Meadow	Functioning-at-Risk

ASPEN

Within this allotment, 1,204 acres of aspen stands show an upward trend. The stands have a diverse age class and are expanding throughout the allotment. While the majority of the aspen are healthy and achieving vegetation objectives, some stands are stressed due to fungus, insects, and disease (Guyon 2006). Past grazing practices have impacted some individual stands; however, these stands are generally small in size and located in areas where cattle have concentrated. Most stands on the Martin Basin Allotment are actively regenerating with

[12] (Collected in a variety of methods and analyzed with criteria set up by the Matrices. Individual study data can be viewed in the project record.)

sufficient young aspen to ensure long-term sustainability of aspen communities on the allotment. As outlined in Table 38, photo comparisons on the Martin Basin Allotment indicate that 67 percent of the photo pairs showed an increase in the size of the aspen stand and/or the density of the aspen canopy. Thirty-three percent showed no change.

UPLANDS

Sagebrush

Mountain big sagebrush communities make up the largest acreages of any vegetation class managed on the Martin Basin Allotment (6,396 acres, 20% of the allotment). This vegetation class includes the following species: low sage (12,035 acres), Wyoming big sagebrush (4,992 acres), and basin big sagebrush (35 acres). Due to fire suppression and historic grazing practices, the sagebrush communities lack a diversity of age classes. Some stands have become decadent, and have lost their natural mosaic pattern (Howard 1999). Sagebrush communities within this allotment tend to be late seral, mature stands and are generally in a static trend. A comparison of the photo sets shows that approximately 53 percent of the photos with sagebrush showed no change, while 40 percent of those sites were increasing in size and/or density of the canopy (Table 38). Vegetation projects (e.g., prescribed fire and mechanical treatments) have been implemented within this allotment to replicate natural fire patterns converting some portions of these sites back to herbaceous dominated vegetation communities. Concerns were expressed that the treatments may increase the rabbitbrush component in these communities. Monitoring has shown that rabbitbrush has remained a constant within and outside the treatment areas.

One trend study indicated an upward trend in a mountain big sagebrush community (Table 40). Understory vegetation has remained static or improved in most of these stands between 1958 and 2006 with a significant decline in bare ground soil (Table 40). The fenceline contrasts in the Martin Basin and Eightmile Allotment show no noticeable differences between the grazed Martin Basin Allotment and the Eightmile Allotment where no livestock grazing is permitted (Vegetation Specialist Report).

Table 40. Martin Basin Allotment Trend Data from Transect Cluster Studies 9 (Studies H501 and 502). (Comparison of percent composition based on nested frequency and ground cover data between 1953, 1959, 1979, and 2006. Complete data in project record and Vegetation Specialist Report.)

YEAR	1953	1959	1979	2006	SIGNIFICANT CHANGES BETWEEN 1954 and 2006
Vegetation Type (Percent Frequency)					
Grasses	47	34	36	42	No Change
Grass-likes	0	8	24	0	No Change
Forbs	23	24	11	26	No Change
Shrubs	31	34	29	31	No Change
Ground Cover (Percent Cover)					
Vegetation	26	20	31	21	No Change
Litter	39	38	32	66	Increasing
Rock	0	0	0	0	No Change
Pavement	1	1	3	1	No Change
Soil	35	41	34	12	Decreasing

Curl-leaf Mountain Mahogany

Curl-leaf mountain mahogany stands (1,483 acres) have increased in size and structure on the Martin Basin Allotment. Photo comparisons on the Martin Basin Allotment indicate that 100 percent of the sites compared are increasing (Table 38). Most curl-leaf mountain mahogany stands on the allotment are characterized by a core of mature trees surrounded by a band of young trees expanding into other vegetative communities. Due to the lack of fire, curl-leaf mountain mahogany stands are expanding and have encroached upon other vegetation communities including sagebrush and mountain brush. Cattle grazing on this allotment impacts a few, very small curl-leaf mountain mahogany stands when they are located near areas where cattle concentrate. The stands impacted by cattle are generally a few trees that create a microclimate where cattle utilize the shade in locations surrounded by large areas of open sagebrush.

Mountain Brush

The mountain brush communities (3,782 acres) include mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities are very diverse and occur through portions of the allotment. On higher elevation mountain slopes, mountain brush communities dominated by snowberry and other species are generally healthy and have increased substantially. Within lower and mid-elevation communities, mountain brush is dominated by bitterbrush which generally lacks a diversity of age classes. These communities are dominated by mature and over-mature plants. A comparison of photo sets shows that approximately 10 percent of the sites compared were static while 90 percent of those sites were increasing in size and/or density of the canopy (Table 38).

NOXIOUS WEEDS

Noxious weed infestations are limited within the Martin Basin Allotment (39 acres, Table 28). Noxious weeds known to occur on the allotment include Scotch thistle, Canada thistle, and hoary cress (not mapped). Bull thistle, an invasive species, is also present. Noxious weed infestations on the Martin Basin Allotment are located in small isolated pockets and generally do not appear to be increasing in size. Hoary cress is found along many roadsides and may be expanding along these roads. Recent treatments have focused on controlling and reducing the spread of this species. Noxious weed treatments appear to be effective at controlling and minimizing infestations on this allotment.

Rebel Creek Allotment

Streams on the Rebel Creek Allotment are generally steep gradient dominated by willow and to a lesser extent aspen communities. Spring, seeps, and meadows occur in this allotment and provide important habitat for wildlife species. The dominant streams within the Rebel Creek Allotment include Rebel Creek, Rock Creek, and McConnell Creek. The dominant vegetative communities within the Rebel Creek Allotment include large stands of mountain big sagebrush, aspen, mountain brush, Wyoming big sagebrush, and mountain mahogany.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS

In general, aspen vegetation communities are functioning while the riparian areas are functioning to functioning-at-risk. Riparian areas in the McConnell Creek Pasture have been impacted by fire, floods, and livestock grazing and is functioning-at-risk due to the undesirable species in the understory. While the streams in the Rebel Creek Pasture are in satisfactory condition, the

meadow complexes at the headwater are degraded. Riparian areas in the Wood Canyon Pasture are functioning. The uplands are generally functioning except for the McConnell Creek Pasture which is functioning at risk due to the large acres of upland vegetation burned in recent fires and cheatgrass in the understory of Wyoming big sagebrush.

This allotment was historically in poor condition from heavy sheep grazing prior to 1946 (USDA Forest Service 1994). In 1965, the Range Allotment Analysis showed no suitable acres in good condition, 635 acres in fair condition, 586 in poor condition, and 780 in very poor. This improved to 57 acres in good condition, 867 in fair condition, 193 in poor condition, and 884 in very poor in 1978. Conditions continue to improve. The Rebel Creek Allotment is currently vacant and has not been used by a term grazing permit holder since 1987. Portions of this allotment have been used on occasion to allow rest and resource recovery on other allotments affected by prescribed burns or wildfires.

Using 12 photos taken within the Rebel Creek Allotment, a total of 64 comparative classes were evaluated. Repeat photos were taken at a variety of intervals from 20 to 78 years; the major time interval between photos was 21 years. The vegetation compared classes on the Rebel Creek Allotment showed an increase in size or density. Grass increased in the repeat photos due to recent fires.

Table 41. Summary of Total Percent Vegetation Changes within each Comparison Class within the Rebel Creek Allotment.

CLASS TYPE	TOTAL PECENT OF PHOTO SETS SHOWING CHANGE		
	Decrease	No Change	Increase
Grass	0%	0%	100%
Sagebrush	0%	44%	56%
Mountain Brush	0%	13%	87%
Aspen	0%	17%	83%
Woody Riparian	0%	0%	100%
Plant Cover	0%	8%	92%

RIPARIAN

Stream Communities

Within the Rebel Creek Allotment, all streams are dominated by woody riparian species and generally appear to be in a functioning condition with an upward trend. Repeat photo analysis showed that 100 percent of photo sets indicated woody riparian sites increasing in size or density (Table 41). Rebel Creek (Rebel Creek Pasture) and Rock Creek (Wood Canyon Pasture and McConnell Creek Pasture) are in satisfactory condition and have improved in condition since 1987 and 1986 (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Rebel Creek had moderate damage during the 1984 flood. A photo comparison of the area between 1984 and 1993 show a significant increase in riparian woody vegetation. McConnell Creek was in satisfactory condition for bank vegetation stability but not bank soil stability (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). Lower McConnell Creek has a history of fires and floods (1972 and 1984). Comparison of the photos and stream survey data with photos taken in 1993 found the willows have significantly increased since 1986. There are locations in the lower reaches streams where cattle grazing has

historically impacted vegetation conditions in the McConnell Creek Pasture. Some willows have a mushroom shape as a result of grazing pressure. Unauthorized use by livestock has been a problem in the past in this area.

Seeps, Springs and Meadows

These communities are primarily located in the headwaters of each of the drainages within the Rebel Creek Allotment. A condition assessment was done for the moist meadow in Rebel Creek Pasture (Ridgeline Spring) in 2006. The condition was found to be functioning-at-risk due to bare ground (16% - functioning is 5%), decreased rooting depth, undesirable species, and high cover of shrubs. These vegetative communities were impacted by historical grazing practices. Many of these sites are currently being impacted by unauthorized grazing in the headwaters of Rebel Creek. These areas are important communities that can be challenging to manage under a livestock grazing program.

ASPEN

Within this allotment, aspen make up a significant portion of the vegetation (3,118 acres or 19% of the allotment, Table 27). In general, aspen stands are in a functioning condition and on a distinct upward trend. The stands have a diverse age class and are expanding throughout the allotment. Repeat photos show aspen is generally increasing or stable (Table 40). Past and current grazing practices have impacted some individual stands; however, these stands are generally small in size and located in areas where cattle have concentrated. One area of concern is in the headwaters of Rebel Creek. Some small aspen stands near springs and small meadows are being impacted by both authorized and unauthorized grazing in the area.

In 2001 the Upper Willow Fire burned several aspen stands within the Rebel Creek Allotment. Site visits to these stands have shown significant regeneration and recovery of the stands. Most aspen stands on the Rebel Creek Allotment are actively regenerating with sufficient young aspen to ensure long-term sustainability of aspen communities on the allotment.

UPLANDS

Sagebrush

Sagebrush communities make up the largest acreages of any vegetation class (40%, Table 27) managed on the Rebel Creek Allotment. This vegetation class is dominated by the following species: mountain big sagebrush (4,036 acres), Wyoming big sagebrush (1,504 acres), low sage (722 acres), and basin big sagebrush (99 acres). The McConnell Creek Pasture was determined to be functioning-at-risk due to large acreages of sagebrush habitats that have burned. Lower elevation Wyoming big sagebrush stands have recovered more slowly primarily due to drought conditions and the effects of cheatgrass invasion. Cheatgrass is present in the understory in the Rebel Creek Pasture but has not increased in dominance in the sagebrush communities.

Mountain Mahogany

Mountain mahogany occurs on 720 acres (Table 27). The major reason for the loss of mountain mahogany stands and the increase in grasses was due to several large fires in 1991, 1993, and 1996. It is unknown how many acres have been lost.

Mountain Brush

This community includes mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities are very diverse, make up a large portion of the vegetative communities, and occur throughout the allotment (2,963 acres or 25% of the allotment, Table 27). These mountain brush communities occur at higher elevation and moist sites, and are dominated by snowberry and other species. These sites are generally healthy communities. A comparison of the photo sets indicates that approximately 87 percent of the photos compared showed increases in size or density of mountain brush classes. Thirteen percent of those photos showed no change (Table 41).

NOXIOUS WEEDS

No noxious weeds are currently known to occur on the Rebel Creek Allotment. However, minimal inventories have been conducted and it is suspected that noxious weeds do occur on the allotment. Noxious weeds that are likely to occur on this allotment would include Scotch thistle.

West Side Flat Creek Allotment

The West Side Flat Creek Allotment is characterized by steep rugged mountain terrain with some open basins of sagebrush. The allotment contains an abundance of small drainages that are generally subsurface when they open up into the Quinn River Valley. The entire allotment is located on the western face of the Santa Rosa Mountains.

Streams on the West Side Flat Creek Allotment are generally steep gradient dominated by willow and to a lesser extent aspen communities. Spring, seeps, and meadows occur in this allotment and provide important habitat for wildlife species. The dominant streams within the West Side Flat Creek Allotment include Flat, Skull, Canyon, Pole, and Three Mile creeks.

As a result of the 2001 Upper Willow Fire, the dominant vegetation community on this allotment is early seral mountain big sagebrush. At higher elevations this community is dominated by native grasses and forbs with some snowberry and limited young mountain big sagebrush. At lower elevations Wyoming big sagebrush is also an early seral community, dominated by cheatgrass with some native grasses and forbs. Other vegetative communities within the West Side Flat Creek Allotment include large stands of aspen, some mountain mahogany, low sagebrush, mountain brush, and riparian.

SUMMARY OF CURRENT VEGETATION CONDITIONS/TRENDS ON THE WEST SIDE FLAT CREEK ALLOTMENT

In general, vegetation communities are functioning while the riparian areas are functioning-at-risk. Some streams appear to be functioning while others are functioning-at-risk. Those streams are still recovering from recent fires and occurrence of undesirable species and noxious weeds in the understory. Cottonwood communities are functioning at risk. Uplands are functioning to functioning-at-risk. Uplands are functioning-at-risk at lower elevations due to fire and the spread of noxious weeds and cheatgrass, while the higher elevation uplands are generally functioning.

RIPARIAN

Stream Communities

Within the West Side Flat Creek Allotment, streams dominated by woody riparian species are functioning-at-risk and generally in an upward trend. Three Mile Creek (North Pasture) and South Fork of Flat Creek (South Pasture) were not in satisfactory condition while Flat Creek was in satisfactory condition (USDA Forest Service, MB MIS/Rangeland Capability Report 2008, Table 1-GAWS data). There are locations along streams where cattle grazing has historically and may be continuing to impact vegetation conditions. Some willows on the allotment have a mushroom shape as a result of grazing pressure. Properly functioning condition assessments for the Three Mile Creek concluded that the three evaluated reaches were in properly functioning condition and in an upward trend (US Forest Service 2006). Some concerns identified included the presence of noxious weeds, the lack of riparian herbaceous vegetation, and raw banks within the lowest reach of the stream. A condition assessment was also completed using the Matrices. "The various attributes for streambank stability and vegetation resources were all determined to be functioning with the exception of noxious weeds" (USDA Forest Service 2006). To address these problems the District has an active weed treatment program and a 1.0 mile long riparian exclosure was constructed on the lowest reach of Three Mile Creek to facilitate recovery of the stream. In 2001, the Upper Willow Fire burned significant acreages within the South Fork Flat Creek, Flat Creek, Skull Creek, Pole Creek, and Canyon Creek drainages. The fire burned many of the willow lined drainages. The willows have resprouted; however, the canopy closure has been reduced.

Matrices were also placed in North Pasture on Canyon Creek in a cottonwood community in 2002. The study found the cottonwood community to be functioning-at-risk. It is important to note that this study was burned in 2001 and is recovering from the effects of that burn.

Seeps, Springs and Meadows

Seeps and springs are abundant within the West Side Flat Creek Allotment. Meadows are limited on the allotment. These communities tend to be small and make up only a small percentage of the total area within this allotment. These areas are, however, very important communities that can be challenging to manage under a livestock grazing program. Although some of these areas are functioning as desired, most are at risk due to noxious weeds, soil compaction, bare ground, and a lack of a desired plant composition. Past management practices such as placing water developments too close to springs and exclosure fences that are too small have prevented many of these sites from fully recovering.

ASPEN

Within this allotment, aspen (1,117 acres, Table 27) are on a distinct upward trend. The stands have a diverse age class and are expanding throughout the allotment. While the majority of the aspen are healthy and achieving agency objectives, some stands are stressed due to fungus, insects, and disease (Guyon 2006). Past grazing practices have impacted some individual stands; however, these stands are generally small in size and located in areas where cattle concentrate.

In 2001 the Upper Willow Fire burned a significant number of aspen stands within the West Side Flat Creek Allotment. Site visits to these stands have shown significant regeneration and recovery of the aspen stands. Most aspen stands on the West Side Flat Creek Allotment are

actively regenerating with sufficient young aspen to ensure long-term sustainability of aspen communities on the allotment.

UPLANDS

Sagebrush

These communities make up the largest acreages of any vegetation class managed on the West Side Flat Creek Allotment (53% of allotment, Table 27). This vegetation class includes: basin big sagebrush (50 acres), Wyoming big sagebrush (2,156 acres), mountain big sagebrush (6,419 acres), low sage (1,562 acres), and rabbit brush. Sagebrush communities on this allotment have experienced multiple large-scale catastrophic fires over the past 30 years. The Upper Willow Fire in 2001 burned approximately half of this allotment. These fires have increase the cheatgrass component within the allotment and eliminated much of the sagebrush seed source. Cheatgrass is a serious problem below 6,000 feet in elevation and on some south facing slopes above 6,000 feet. Noxious weeds are a serious threat within many of the drainages. Higher elevation sagebrush sites have recovered to native grasses, and forbs and young sagebrush seedlings are beginning to slowly reestablish.

One trend study preformed in 1955, 1965, 1979, and 1983 showed an upward trend in mountain big sagebrush (Parker Three Step, Study H-508, Vegetation Specialist Report). The bare ground was significantly lower from 30 to 14 percent. Grass significantly increased from 1955 to 1983 while the sagebrush decreased in frequency allowing the recovery of the understory.

Curl-leaf Mountain Mahogany

Many of these stands (421 acres) burned or were impacted during the Upper Willow Fire in 2001. These stands are still recovering from recent fires.

Mountain Brush

This community (3,602 acres) includes mountain brush, snowberry, current, chokecherry, rose, and other associated species. These communities occur in high elevation basins and have been affected by multiple wildfires. Mountain brush communities have responded more favorably to wildfires and are generally healthy.

NOXIOUS WEEDS

Noxious weed infestations are of considerable concern on the West Side Flat Creek Allotment (378 acres, Table 28). Noxious weeds known to occur on the allotment include Scotch thistle, hoary cress, and Canada thistle. Bull thistle, an invasive species is also present. Large-scale fires and significant infestations of noxious weeds on adjacent private and BLM lands are contributing to the noxious weed problems on this allotment. Noxious weed infestations on the West Side Flat Creek Allotment are generally larger in size and appear to be expanding in the case of both hoary cress and Scotch thistle. Aggressive treatments have occurred over the past several years and will continue into the 2009 field season.

Forest Service Sensitive Plant Species

Sensitive species are determined by the Regional Forester (FMS 2670) and are those species for which population viability is a concern. The Region 4 Sensitive Species list was evaluated for species that may occur in the project area. The evaluation of species, affected environment, and potential environmental effects of the alternatives on sensitive plant species are disclosed in the Botany Specialist Report in the project record. The results are summarized in Table 42.

Table 42. Sensitive Plants within the Project Area.

SCIENTIFIC AND COMMON NAME	HUMBOLDT-TOIYABE STATUS	STATE STATUS	HABITAT DESCRIPTION	ALLOTMENTS WITH POTENTIAL HABITAT
Osgood Mountain milkvetch ***(Astragalus yoder-williamsii)***	R4 Sensitive	Fully Protected	Decomposed granite gravel flats in sagebrush communities at 5,170 to 7,300 feet	Buffalo Granite Peak Rebel Creek
Obscure scorpion plant **(*Phacelia inconspicua)***	R4 Sensitive	Fully Protected	Steep north or northeast facing slopes on loose soil rich in organic matter at 5,000 to 8,630 feet	All Allotments

Osgood Mountain milkvetch (Astragalus yoder-williamsii)

The distribution of Osgood Mountain milkvetch is from the crest of the northern end of the Osgood Mountains, Humboldt County, Nevada, and the Owyhee Uplands in Owyhee County, Idaho and reports from Oregon (NatureServe 2003). Mozingo and Williams (1980) recognized potential habitat in the southern portion of the Santa Rosa Ranger District. Potential habitat was mapped for Osgood Mountain milkvetch. On the Santa Rosa Ranger District, 3,792 acres of potential habitat exists with 1,911 occurring in the Martin Basin Project Area in the Buffalo, Granite Peak, and Rebel Creek Allotments. Over 1,881 acres have been surveyed in the Santa Rosa Ranger District (Knight 1991).

This species is restricted to dry, open, coarse decomposed granite soils on flats and gentle slopes, or loose silty soils on moderate south slopes in sagebrush steppe vegetation, mountain big sagebrush (from Idaho) or low sagebrush (from Nevada). It can grow among or near boulders. Associated shrub species are low sagebrush (*Artemisia arbuscula*), mountain sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and rubber rabbitbrush (*Ericameria nauseosus*) (Knight 1991, Morefield 2001). Plants occur between shrubs in open spaces (Mancuso and Moseley 1993). The reported elevation range is between 5,170 to 7,300 feet.

Osgood Mountain milkvetch appears to tolerate some disturbance including fire (Juncosa 1997, Mancuso and Moseley 1993). In Nevada, the populations have also experience livestock grazing as well as activities associated with the road that passes through the population (Juncosa 1997). Threats associated with the known sites include mining, road maintenance, and off-road vehicle use, trampling by livestock and feral animals, and competition from invasive weeds (Morefield 2001).

Obscure scorpion plant (Phacelia inconspicua)

Obscure scorpion plant is distributed across four sites in the Humboldt Mountains, Pershing County, Nevada, and six sites in the Snake River Plains of Blaine and Butte Counties, Idaho. Suitable stands of mountain big sagebrush occur in most of the higher ranges of central and northern Nevada (Holland 1996). Potential habitat has been mapped for obscure scorpion plant. On the Santa Rosa Ranger District, 65,609 acres of potential habitat exists with 44,585 occurring in the Martin Basin Project Area. Potential habitat occurs in all the allotments. Few formal surveys have been conducted. There are currently no known locations in the project area.

In Nevada, obscure scorpion plant is restricted to small, sandy pockets between mountain big sagebrush (*Artemisia. tridentata* ssp. *vaseyana*), ocean spray (*Holodiscus microphyllus*), snowberry (*Symphoricarpos oreophilus*), and basin wildrye (*Leymus cinereus*) plants usually surrounded by low sagebrush (*Artemisia arbuscula*), ephemerally moist drainages, and the edge of aspen (Holland 1996, Idaho Fish and Game 2003). The species is found in deep organic-rich soils on steep to very steep, north or northeast facing concave slopes which receive extra ground water, surface runoff, or slope wash from persistent snow drifts upslope which provide seasonal soil saturation and enhance the soil moisture throughout the year (Holland 1996). The obscure scorpion plant occurs in microsites that lack soil cover in small clearings among the shrubs and beneath shrubs where it can locally dominate the herbaceous understory. The elevation range of known populations is 5,000 to 8,360 feet.

Observations suggest that obscure scorpion plant is an early to mid-seal species that is adapted to fire and other low-level soil disturbance (Holland 1996, Moseley 1989, Murphy 2002). "The species probably requires occasional fire to open the overstory, combined with soil disturbance on the microsite level, for germination and reproduction" (Murphy 2002). Closure of the canopy may competitively limit obscure scorpion plant. However, fire may also increase weedy annual species increasing competition in the understory (Murphy 2002). Low-level soil disturbances may also maintain microsite conditions for obscure scorpion plants (Murphy 2002). Disturbances in known habitat include ungulate and livestock trailing, natural soil creep, frost heaving, and small mammal disturbances. Although obscure scorpion plant appears to require periodic disturbance by fire to regenerate its populations, the species does not appear capable of colonizing disturbed soil such as tailing piles and road cuts in its habitat (Holland 1996). The plant is also not capable of colonizing undisturbed soil in other habitat types. Threats associated with known sites include mineral exploration and development, fire suppression and catastrophic fire, competition with invasive weeds, and concentrated trampling by livestock and feral horses (Holland 1996, Morefield 2001, Murphy 2002).

ENVIRONMENTAL CONSEQUENCES

Riparian

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Meadows, Springs, and Seeps

Meadows, springs, and seeps are currently managed in accordance with Amendment 2 for the Humboldt National Forest Land and Resource Management Plan (USDA Forest Service 1990). For the allotments within the Martin Basin Rangeland Project Area, the allowable utilization generally ranges from 45 to 65 percent by weight of current growth. All meadows, springs, and seeps in the project area have undergone a categorization process to verify their appropriate category and utilization standard in accordance with Amendment 2. Livestock grazing in wet meadow communities (rhizomatous species) with higher utilization, along with compaction can reduce herbage production (Clary 1995). Because meadows, springs, and seeps are dispersed throughout the uplands, livestock tend to favor these areas, and higher utilization levels are often noted in many of these communities.

Under Alternative 1, meadows, springs, and seeps would continue to be impacted by livestock in areas where appropriate protection measure have not been taken. Many meadows, springs, and seeps are isolated and difficult to manage. Some of these communities have been fenced to protect the sites. Under Alternative 1, a portion of these communities would likely continue in a downward trend. Others would remain stable, while some of these communities would improve where appropriate protection measures have been taken and/or livestock management practices have facilitated recovery. Examples include numerous small spring exclosures, the exclosures around Buttermilk Meadows, Camus Springs, and meadows at Round Corral, all on the Buttermilk Allotment.

Cottonwood Communities

Light-to-moderate grazing on species such as willow and cottonwood appears to have little adverse effect and in some cases may stimulate growth (UCCE 2008). This would indicate the current allowable browse utilization levels of 35 percent should allow for some reproduction and survival of the “suckers,” or new shoots. Under this alternative, most cottonwood communities would continue to have limited recruitment. Problems associated with genetic diversity and the small size of the communities may continue to pose a risk to the stands. Some isolated cottonwood stands in areas where livestock congregate would continue to be impacted under this alternative. The impacts may result in a downward trend in these isolated stands because of browsing and/or trampling effects.

Streams

Streams are currently managed in accordance with Amendment 2 for the Humboldt National Forest Land and Resource Management Plan (USDA Forest Service 1990). For the allotments within the project area, the allowable utilization generally ranges from 35 to 65 percent by weight of current growth. The majority of allotments are managed with rest rotation grazing systems. These systems when coupled with light to moderate grazing should maintain the current

conditions of the riparian vegetation associated with streams. Where current allowable utilization levels are between 35 and 45 percent, which is considered light to moderate, they would continue to provide healthy vegetation communities along streams that are functioning as desired (Clary and Webster 1989, and Ratliff et al. 1987). Current allowable use levels of up to 45 percent should maintain current conditions in most areas (Sedgwick and Knopf 1991). Those areas functioning-at-risk or non-functioning may not recover and could deteriorate further under Alternative 1.

In Category 3-5 streams, the utilization standards can be as high as 65 percent, which can affect the condition and trend of the stream vegetation. Three important factors that affect how grasses respond to grazing include frequency, intensity, and season of use (Trlica 1999). Grazing utilization levels can result in a reduction in root growth. When 10-40 percent of grass leaf volume is removed, there is a 0 percent change in percent root growth. When 50 percent of grass leaf volume was removed, there is a 2-4 percent root growth stoppage. As use approached 60 percent removal, there is a 50 percent stoppage in root growth. When grazing utilization reaches 70 percent of grass leaf volume, there is a 78 percent root growth stoppage, and grazing 80-90 percent of grass leaf volume resulted in a 100 percent root growth stoppage (Dietz 1989). Under this alternative, livestock grazing on Category 3-5 streams poses a greater risk to the condition and trends for the vegetative communities on those streams.

As utilization levels approach 65 percent, there is also increased potential that the health of individual plants may be affected. These systems are also less resilient due to drier and often intermittent flow conditions, which allow less opportunity for recovery after grazing. Studies have found that rest rotation grazing with 65 percent use or higher can resulted in altered riparian habitat conditions (Kauffman and Krueger 1984, Sedgwick and Knopf 1991). Other management issues including frequency and season of use may also influence the potential for these impacts. In these communities if this higher intensity is combined with long seasons of use and repeated hot season grazing, there would likely be impacts to the health of these riparian communities.

Although conditions on portions of Category 1 and 2 streams are believed to be in good to excellent condition with stable to upward trends (Photo 12-14), there are more streams or portions of streams that may be in less than desirable condition with possible downward trends. Without a change in management practices or other active management to correct the problems, these conditions may continue to decline. An example would include portions of the South Fork of the Quinn River where unauthorized livestock grazing and wildfires have resulted in serious impacts to riparian communities. These impacts have been addressed through changes in rotations, reductions in utilization standards, and management actions to address unauthorized livestock.

Photo 12. East Fork Quinn River.
(A fall picture looking at the lack of willows (1990).)

Photo 13. 1996 Retake of Photo 12.
(Comparing the willow growth on the same section of the stream.)

Photo 14. 2001 Retake of Photo 12 and 13 Showing Well-Armored Stream with Willows.

Cumulative Effects

Meadows, Springs, and Seeps

Mining and mineral exploration have historically affected several springs and seeps near Buckskin Mountain on the West Side Flat Creek and Martin Basin Allotments. A couple of springs also were historically impacted near Spring City on the Buttermilk Allotment. These activities have altered vegetation near the spring and may have changed flow patterns. These impacts are isolated and localized to just a few sites within the project area. The cumulative impacts to springs, seeps, and meadows in the project area are minimal.

Historic and potential future livestock developments associated with grazing allotments can have a wide range of potential cumulative effects. Historically many livestock water developments were placed close to springs or seeps. Often the spring was fenced; however, congregating livestock near the spring site affected soil compaction and vegetation surrounding the spring

source. The small exclosure around the spring provided some protection to the site and minimized the impacts. Future developments would be planned away from the spring sources. Water developments can decrease available water at a spring resulting in changes in vegetation or shrinking in the size of the spring influenced area. This may occur on very small springs and seeps.

Roads, trails, and vehicle use have resulted in impacts to springs, seeps, and meadows throughout the project area. Improperly placed roads have historically resulted in headcuts and downcutting near these sites and can result in damage to vegetation around meadows and springs. An analysis has been completed and a decision issued for a Travel Management Plan for the District. This plan would reduce impacts to springs, seeps, and meadows by prohibiting off-road travel by vehicles. Vehicles are restricted to designated roads. Impacts to springs, seeps, and meadows from existing open roads would continue; however, the overall cumulative effects of vehicle use would be reduced.

Wildfires have also had considerable effects on springs, seeps, and meadows. These effects are most evident in all or portions of the Granite Peak, Indian, Quinn River, and West Side Flat Creek Allotments. Wildfire can change the vegetation on the sites and make the area more vulnerable to invasive species or other impacts. Areas that have burned in the past have been rested for 2 years following the burn, which generally allows recovery of these vegetation communities.

Noxious weeds have historically and currently affected a number of springs and meadows in the project area. Weeds that most commonly infest springs and meadows in the project area include Canada thistle, hoary cress, and Scotch thistle. An aggressive identification and treatment program on the District has continued to minimize the cumulative effects of noxious weeds on seeps, springs, and meadows.

Dispersed recreation occurs throughout the project area. These activities include camping, day use, hiking, horseback riding, OHV and vehicle use (addressed above), hunting, fishing, and others. Dispersed use activities on or near springs and meadows can trample or damage vegetation resulting in a decline in condition. These activities can also result in compaction at the sites, which can affect long-term productivity. Some of the impacts associated with use of vehicles will be addressed through the Travel Management Plan addressed above.

Wildlife and fisheries habitat improvement and watershed projects that have or could potentially occur in the project area would generally result in positive cumulative effects on springs, seeps, and meadows within the project area. These projects rehabilitate or protect springs, seeps, and meadows. Examples of these projects include the Buttermilk Meadows Riparian Exclosure, the Round Corral Exclosure, the Camus Springs Restoration Project and exclosure, the Abel Creek Headcut Project, Cabin Creek Wetland Project, and the Quinn River Headcut Project. All of these projects have successfully restored or protected springs, seeps, and meadows within the cumulative effects area. The District is also just beginning the planning on the Bullion Springs Watershed Project. This project will involve the complete reconstruction and restoration of approximately 1.4 miles of Buttermilk Creek which is located within the Spring City Pasture of the Buttermilk Allotment.

Cottonwood Communities

Fuelwood harvest generally occurs within aspen communities on the District; however, on occasion woodcutters may cut dead and down cottonwood trees. Woodcutting in these stands can

damage young trees or result in disturbance to the stands. The impacts from this activity are minimal due to the limited woodcutting that occurs on the District.

Wildfires have affected cottonwood communities within portions of the West Side Flat Creek and Buffalo Allotments. Mature stands have been burned resulting in the loss of the overstory component. Monitoring of these stands has shown that regeneration is generally vigorous and sufficient to maintain the stands on the sites (as was documented above for the stands in Canyon Creek).

Dispersed camping and day use impacts some cottonwood stands on the Santa Rosa Ranger District. Cottonwood trees are damaged around dispersed campsites by visitors cutting or attaching ropes, wires, nails or other objects to the trees. Trampling can affect young trees and result in compaction of the soils. Locations where this is most common include dispersed campsites along Indian Creek and Mullinex Creek on the Granite Peak Allotment; Abel Creek on the Paradise Allotment; and small dispersed sites on Buffalo, Falls, and Horse creeks on the Buffalo Allotment. These impacts are localized and generally occur in areas covering less than 0.50 acre in size.

Streams

Mining and mineral exploration activities have historically affected Eightmile Creek and National Creek on the West Side Flat Creek Allotment. Historical mining activities and more recent exploration activities have had considerable impacts on the upper reaches of the North Fork of the Little Humboldt River on the Martin Basin Allotment. Historical mining has contributed to acid mine drainage into the headwaters of both the North Fork of the Little Humboldt River and Eightmile Creek. A recent drilling fluid spill on the North Fork of the Little Humboldt River resulted in sedimentation of fine clays into the system. The action can affect riparian vegetation along these streams and result in degradation of the habitats. Currently two projects are ongoing to clean-up the spill and address the acid mine drainage on the sites. These impacts are limited to just a few drainages.

Historic and potential future livestock developments associated with grazing allotments can have a wide range of potential cumulative effects. Generally, these developments would have a positive cumulative effect by dispersing cattle away from streams and providing off-site water. Fences would often improve the management of livestock to protect or improve the conditions of riparian areas and streams. Historically, not all fences were located with stream management in mind. Therefore, some fences may contribute to impacts on streams by congregating livestock in specific areas. Overall, livestock developments should result in a positive cumulative effect within the project area.

Roads, trails, and vehicle use have resulted in impacts to streams throughout the project area. Improperly placed roads have historically resulted in headcuts and downcutting near these sites and can result in damage to vegetation along streams. An analysis has been completed and a decision issued for a travel management plan for the District. This plan will reduce impacts to streams by prohibiting off-road travel by vehicles. Vehicles will be restricted to designated roads. Impacts to streams from existing open roads would continue, however, the overall cumulative effects of vehicle uses would be reduced.

Wildfires have also had considerable effects on streams within the project area. These effects are most evident in all or portions of the Granite Peak, Indian, Quinn River, and West Side Flat Creek Allotments. Wildfires can change the vegetation on the streams and make the sites more

vulnerable to invasive species or other impacts. Areas that have burned in the past have been rested for 2 years following the burn, which generally allows recovery of these vegetation communities.

Noxious weeds have historically affected a number of streams in the project area. Weeds that most commonly infest streams in the cumulative effects area include Canada thistle, hoary cress, leafy spurge, and Scotch thistle. An aggressive identification and treatment program on the District has continued to minimize the cumulative effects of noxious weeds on streams.

Dispersed recreation occurs throughout the project area. These activities include camping, day use, hiking, horseback riding, OHV and vehicle use (addressed above), hunting, fishing, and others. Dispersed use activities on or near streams can trample or damage vegetation resulting in a decline in condition. These activities can also result in compaction at the sites, which can affect long-term productivity. Some of the impacts associated with use of vehicles will be addressed through the Travel Management Plan addressed above. Streams where impacts from dispersed recreation are most often observed include Lye Creek and Road Creek on the Buttermilk Allotment, Cabin Creek on the Martin Basin Allotment, Dutch John Creek on the Bradshaw Allotment, the East Fork of the Quinn River on the Quinn River Allotment, and Indian Creek on the Granite Peak Allotment.

Wildlife and fisheries habitat improvement and watershed projects that have or could potentially occur in the project area would generally result in positive cumulative effects on streams within the project area. These projects would rehabilitate or protect streams (e.g., the Three Mile Exclosure on the West Side Flat Creek Allotment). These projects successfully restore or protect streams within the cumulative effects area.

ALTERNATIVE 2 – The Proposed Action/Preferred Alternative

Direct and Indirect Effects

Meadows, Springs, and Seeps

Under Alternative 2, the maximum allowable utilization would be reduced from 65 percent to a maximum of 45 percent. The condition of seeps, springs, and meadows would be determined within each allotment and pasture using the Matrices at representative sites (Appendix A). In cases where the condition of seeps, springs, and meadows are functioning-at-risk or are non-functioning, Alternative 2 would adjust utilization and allow management changes to correct the concerns. This alternative would result in an upward trend in the condition of most seeps, springs, and meadows. Communities that are currently functioning as desired would continue to maintain that level.

Under Alternative 2, the condition of these communities should improve faster than with Alternative 1, but slower than with Alternative 3.

Cottonwood Communities

Under Alternative 2, the condition of cottonwood stands would be determined within each allotment and pasture using the Matrices at representative sites. Allowable utilization in this community would allow a maximum of 20 percent browse utilization on the available suckers. Some cottonwood stands may receive total protection from grazing if they are non-functioning. In cases where the conditions of cottonwood communities are functioning-at-risk or non-

functioning, Alternative 2 would adjust utilization and allow management changes to be considered to correct the concerns. Where utilizations are set to 20 percent, this alternative would result in an upward trend in the condition of most cottonwood communities by increasing the success of recruitment of suckers and saplings, decreasing soil compaction and bare ground, and improving the understory species composition. This alternative would result in an upward trend in the condition of most cottonwood communities. Communities that are currently functioning as desired would continue to maintain that level.

Under Alternative 2, the condition of these communities should improve faster than with Alternative 1, but slower than with Alternative 3.

Streams

Under Alternative 2, the maximum allowable utilization would remain at 45 percent on Category 1 and 2 streams. The maximum allowable utilization would be reduced to 45 percent on all Category 3-5 streams. The condition of streams would be determined within each allotment and pasture using the Matrices at representative sites. In cases where the condition of stream communities are functioning-at-risk or have crossed below threshold, Alternative 2 would adjust utilization and allow management changes to correct the concerns. This alternative would result in an upward trend in the condition of most stream communities. Communities that are currently functioning as desired would continue to maintain that level (Clary 1995).

Under Alternative 2, the condition of Category 3-5 streams should improve faster than with Alternative 1, but slower than Alternative 3. The condition of Category 1-2 streams should improve at a similar rate as Alternative 1, but slower than with Alternative 3.

Cumulative Effects

Meadows, Springs, and Seeps

The cumulative effects of this alternative on meadows, springs, and seeps would be similar to those effects disclosed for Alternative 1 but reduced due to the decrease in utilitzation at streams with 65 percent use.

Cottonwood Communities

The cumulative effects of this alternative on cottonwood communities would be similar to those effects disclosed for Alternative 1 but reduced due to the decrease in utilization to improve condition to functioning.

Streams

The cumulative effects of this alternative on streams would be similar to those effects disclosed for Alternative 1 above.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Meadows, Springs, and Seeps

Under Alternative 3 (No Grazing/No Action), livestock grazing would be eliminated. After removal of grazing with Alternative 3, the condition of seeps, springs, and meadows should improve rapidly; however, permanent removal of grazing would not guarantee sustained increases in herbaceous plant production. One study indicated the following: "the meadow reached peak production in 6 years and then declined until production was similar to the adjacent area grazed season-long"; "the accumulation of litter over a period of years seems to retard herbage production in wet meadow areas" (Clary and Webster 1989). Under Alternative 3, the condition of vegetation at seeps, springs, and meadows would improve, ground cover would increase, soil compaction from livestock grazing would be reduced, and there would be a shift at many sites from early seral species such as Kentucky bluegrass to more late seral species such as sedge. Over the long term, there would be a reduction at many sites in the component of various forb species, which can be important to many wildlife species such as sage grouse (Green and Kauffman 1995).

Cottonwood Communities

Under Alternative 3, livestock grazing would be eliminated. After removal of grazing, the condition of cottonwood communities would improve rapidly or remain in a stable condition. Without livestock grazing, browsing of suckers and saplings and trampling would be reduced substantially. Survival of suckers and saplings should increase. Stands that are currently affected by other influences such as degraded understories, genetic issues, and recreational impacts would remain stable or continue to decline.

Streams

Under Alternative 3, livestock grazing would be eliminated. After removal of grazing, the condition of some streams should improve rapidly, while the trend of other streams would improve, but at a slower rate (Myers and Swanson 1995). Under Alternative 3, willow communities would regenerate more rapidly on most streams. Streams that are dominated by early seral species such as Kentucky bluegrass would improve rapidly and over time the species component would become more dominated by later seral species such as sedges (Schultz and Leininger 1990). Bare ground should decrease.

Cumulative Effects

The potential cumulative effects on riparian communities of the various programs, projects, and actions described above would be similar to those effects disclosed under Alternative 1. Because the impacts of livestock grazing would be eliminated under this alternative, the potential cumulative effects would be reduced. The following are additional cumulative effects that could result from the implementation of Alternative 3.

There would no longer be a need for most livestock water developments and allotment fences. These developments would be removed over time. The removal of these developments and the fact that there would be no further developments in the future would result in a positive cumulative effect upon riparian vegetative communities.

The potential cumulative effects of roads and vehicle use would be similar to Alternatives 1 and 2, with a minor exception. Without livestock grazing, the vehicle traffic on the Santa Rosa Ranger District would be slightly reduced as permittees would not use the roads to manage grazing allotments. This change in cumulative impacts would be minimal and the potential effects from other activities would continue to occur.

Under Alternative 3, there is potential for an increase in fuel loads within portions of the cumulative effects area. Without livestock grazing, fine fuels would accumulate and could result in an increased risk of wildfire. Fire can be an important disturbance to sucker regeneration in cottonwood stands.

Under Alternative 3, the potential cumulative effects associated with noxious weeds would be reduced (Green and Kauffman 1995). Without grazing there would be a reduction in ground disturbance and an increase in overall ground cover in riparian areas. This would result in fewer locations where noxious weeds can be easily established. With the removal of livestock from these allotments, the risk that livestock would transport noxious weed seed into the project area would be reduced.

Aspen Communities

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, most aspen stands within the project area would remain in a stable condition or continue in an upward trend. Current information regarding the condition of aspen stands in the project area indicates that most stands are functioning and regenerating under current management.

Utilization standards for aspen stands in upland communities allow a maximum of 65 percent use of the herbaceous understory in the stands. The maximum utilization standard for aspen would be 35 percent use on riparian browse and 50 percent on upland browse.

If the 65 percent herbaceous use and 50 percent upland browse use were reached, the functioning aspen stands would not be able to regenerate and would begin to decline. Generally this standard is not reached, due to cattle grazing the herbaceous component to standard prior to reaching the browse standard and being required to leave the area. In addition, meadow utilization standards are the limiting factor for livestock use in the project area possibly resulting in less use in the aspen stands than allowed. Both are possible explanations for the functioning condition of the larger stands in most allotments. The 35 percent riparian browse may be reached in some cases, and could impact the survival of enough saplings or suckers and therefore, the integrity of the aspen stands.

Aspen stands located in areas where livestock tend to congregate and in some small isolated stands would continue to be impacted by livestock grazing. These isolated stands are at risk and some may be lost over the long term. As grazing approaches maximum use levels, livestock begin to increasingly browse young aspen which may impact the health of these stands. The locations most affected are sites where water developments have been located too closely to aspen stands. Other sites include aspen stands near isolated springs, and stands associated with benches and flat sites where livestock bed down and shade up.

Cumulative Effects

The cumulative effects areas for this project would include the National Forest System lands within the project area and all private lands within its boundaries. The cumulative effects area allows us to determine these effects for a wide range of species and their habitats. Ongoing activities that are acting cumulatively with livestock grazing to negatively affect aspen stands are wildfires, activities associated with livestock management, roads and motorized trails, fuelwood harvest, and dispersed and developed camping. Improvement projects have benefited aspen communities.

Wildfires have impacted aspen communities within portions of the Granite Peak, Indian, Martin Basin, Rebel Creek, and West Side Flat Creek Allotments. Mature stands have burned resulting in the loss of the overstory component. Monitoring of these stands has shown that regeneration is generally vigorous and sufficient to maintain the stands on the sites.

Livestock developments including fences and water developments can result in cumulative effects on aspen stands. In the past some water developments were located within or adjacent to aspen stands, which resulted in cattle congregating within and affecting the stands. Fences can also affect aspen communities by concentrating livestock use adjacent to or within aspen communities. These effects are generally isolated and result in impacts from livestock trailing along fence lines.

Roads, trails, and vehicle use have resulted in limited impacts to aspen stands within the project area. Improperly placed roads have historically resulted in impacts to aspen regeneration along the edges of existing aspen stands. Off-road vehicle use can damage young trees and cause compaction of soils within aspen communities. The District has completed the analysis and issued a decision for a Travel Management Plan. This plan will reduce impacts to aspen by prohibiting off-road travel by vehicles. Vehicles will be restricted to designated roads. Impacts to aspen from existing open roads would continue; however, the overall cumulative effects of vehicle uses would be reduced.

Fuelwood harvest occurs within aspen communities on the District. Approximately 25 cords of fuelwood are cut annually. Fuelwood harvest is limited to dead and down aspen; however, cutting in these stands can damage young trees or result in disturbance to the stands. The impacts from this activity are minimal due to the limited fuelwood harvest that occurs on the District.

Dispersed and developed camping, day use, and other recreational activities impact several aspen communities on the Santa Rosa Ranger District. Aspen trees around dispersed and developed campsites are damaged by visitors cutting trees or attaching ropes, wires, nails or other objects to the trees. Trampling by visitors can affect young trees and result in soil compaction. Locations where this is most common include the Lye Creek developed campground and dispersed campsites in Lye Creek, Road Creek, and Round Corral Creek on the Buttermilk Allotment; along Indian Creek and Mullinex Creek on the Granite Peak Allotment; Abel Creek on the Paradise Allotment; and Cabin Creek on the Martin Creek Allotment. These impacts are localized and generally occur in areas covering less than 0.50 acre in size.

Wildlife and fisheries habitat improvement and watershed projects that have or could potentially occur in the project area would generally result in positive cumulative effects on aspen stands within the project area. Examples of projects that resulted in positive cumulative effects on aspen include the Three Mile Exclosure on the West Side Flat Creek Allotment, and the Round Corral Exclosure, Buttermilk Meadows Exclosure, and the Camus Spring Exclosure on the Buttermilk

Allotment. These projects have successfully restored or protected aspen stands within the cumulative effects area.

Large aspen stands would continue to function and would be similar to Alternative 2. However, small isolate aspen stands and in areas where maximum use is achieved would decline under Alternative 1.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

The potential impacts of livestock grazing under Alternative 2 would be similar to those effects disclosed under Alternative 1. Under this alternative browse utilization would be limited to no more than 20 percent of available suckers which provides for adequate regeneration from sucker and saplings. Utilization of the herbaceous understory would be reduced from 65 percent to a maximum of 45 percent. If the functioning level of the stand declines, the appropriate management action would be taken to improve the condition of the aspen stands.

Condition of small stands and areas where cattle congregated tend to be in lower condition than the larger aspen stands. Problems with condition in aspen stands tend to be isolated. For those stands that are functioning-at-risk, there should be reduced grazing of suckers to allow them to improve success of recruitment of suckers and saplings. Also, less time in the aspen stands due to the reduced use would also improve soil conditions and increase the percentage of desirable, native species. If the stands are currently on an upward trend, the rate of improvement may increase. There should be an increase in the amount of suckers and saplings, even on the years livestock are in the area.

Some aspen stands may continue to be impacted as described in Alternative 1. These stands are in areas where livestock typically congregate. Under both Alternative 1 and 2, management changes may be implemented to address site-specific problems within isolated aspen stands. These changes may include a change in rotations, season of use, herding, fencing, or even removal or relocation of developments could be considered to address issues. Changes in livestock developments or fencing of stands to protect them would require additional NEPA analysis. Under this alternative, most aspen stands would maintain a stable to upward trend in condition.

Cumulative Effects

Cumulative effects would be similar to Alternative 1 but reduced due to the decrease in utilization to manage for ecological condition. Under Alternative 2, aspen stands would continue to function. Small stands with increased impacts or functioning-at-risk would show greater improvements than under Alternative 1 but less than Alternative 3.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under this alternative, use from livestock would not continue. This would allow for those aspen stands that are currently functioning to maintain their healthy state. The rate of improvement for those aspen stands that are functioning-at-risk should increase. The amount of aspen suckers and saplings should increase due to the lack of browse by livestock.

Aspen stands that are non-functioning due to causes other than livestock grazing may not show much recovery even after livestock have been removed. Other management actions may be required to change the condition of these stands.

Cumulative Effects

The potential cumulative effects on aspen communities of the various programs, projects, and actions described above would be similar to those effects disclosed under Alternative 1. Because the impacts of livestock grazing would be eliminated under this alternative, grazing as a potential cumulative effect would be reduced.

There would no longer be a need for most livestock water developments and allotment fences. These developments would be removed over time. The removal of these developments and the fact that there would be no further developments in the future would result in a positive cumulative effect upon riparian vegetative communities.

The potential cumulative effects of roads and vehicle use would be similar to Alternatives 1 and 2, with a minor exception. Without livestock grazing the vehicle traffic on the Santa Rosa Ranger District would be slightly reduced as permittees would not use the roads to manage grazing allotments. This change in cumulative impacts would be minimal and the potential effects from other activities would continue to occur.

Under Alternative 3, the potential cumulative effects associated with noxious weeds would be reduced (Green and Kauffman 1995). Without grazing there would be a reduction in ground disturbance and an increase in overall ground cover in riparian areas. This would result in fewer locations where noxious weeds can be easily established. With the removal of livestock from these allotments, there would also be a reduced risk that livestock would transport noxious weed seed into the project area.

Alternative 3 would result in the most rapid improvement in aspen communities of the three alternatives.

Upland Vegetation Communities

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Sagebrush and Mountain Brush

Under Alternative 1, the current trends in upland vegetation conditions would continue. Alternative 1 allows livestock utilization of up to 65 percent of herbaceous vegetation. Grazing levels beyond 45 to 50 percent may begin to have a detrimental effect on plants (Dietz 1989) Livestock grazing can affect sagebrush communities through the direct impact of trampling on specific plants and injuring or killing them, or by removing too much of the plants too often which could affects its ability to process sunlight and grow healthy vigorous roots, leaf material, and seeds.

On most sites, the grass species in sagebrush communities usually are not grazed at the maximum utilization levels. Steeper slopes and increased distance to water results in less livestock use on large portions of the project area. Most often, maximum utilization levels are reached first in the riparian areas and then adjacent uplands. Livestock use is generally lighter as the slopes and

distance from water increase. Livestock are normally removed from the area before the uplands have been grazed to the maximum utilization standards.

These areas receive only light grazing intensity and in some cases receive no grazing use as a result of poor livestock distribution. Those areas within allotments that receive only light to no grazing pressure generally have relatively healthy grass and forb communities with abundant litter and ground cover. The exceptions are those lower elevation sites where cheatgrass has dominated the upland vegetation communities. These sites occur on the northern and western portions of the Santa Rosa Ranger District, generally in areas that have been altered by catastrophic wildfires.

Upland vegetation communities on more gentle slopes and in areas where water is more abundant or readily accessible are generally grazed more frequently and consistently by livestock within the project area. In general, upland vegetation communities closer to water developments often receive a greater intensity of use and may consistently reach 65 percent utilization levels. In areas where current use is 65 percent, areas that are functioning would have the potential for a downward trend. When 50 percent or more of forage from grass species is removed, plant vigor is negatively affected (Dietz 1989). There would also be a reduction in litter, greater percentages of bare ground, and potential for increases in soil compaction and erosion, which would further impact the condition of the upland vegetation communities. Areas that are used heavily increase the potential for shrub dominance. Large numbers and high concentrations of livestock potentially favor establishment of woody plant species such as sagebrush in numerous ways. Compaction of surface soils may favor recruitment of woody plants over grasses (Heitschmidt and Stuth 1991). The sagebrush community would also be more vulnerable to establishment of less desirable annual grasses and forbs and introduction of noxious weeds (Anderson and Inouye 2001, Chambers et al. 2007).

Holechek and others (1998) indicate that utilization standards that approach 65 percent use are considered heavy grazing. In northwestern Arizona, Holechek and others (1998) also noted that high utilization (above 50%) that occurred in some years harmed desired grasses even when followed by rest. They also documented that rest and deferment were not sufficient to overcome the effects of periodic heavy use (65%) on primary forage plants when rest rotational grazing was applied on big sagebrush range in northern Nevada. Heavy use (65%) during the growing season in the Wyoming big sagebrush range in northern Nevada restricted the basal area growth (Eckert and Spencer 1987). Rest and deferment (rest rotation system) were not sufficient to overcome the effects of periodic heavy use.

Climate change may change the dynamics of the uplands systems. Predictions about the effects of climate change are varied. The dynamics with cheatgrass may change which would increase the risk to low elevation sagebrush types including Wyoming big sagebrush but also increase the risk to mountain big sagebrush. Cheatgrass invasion is primarily limited by temperatures at upper elevations followed by available water (Chambers et al. 2007). Environmental changes would change the competitive environment for cheatgrass. Also, higher levels of CO2 may result in higher production and water-use efficiency of cheatgrass (Smith et al. 2000).

Mountain Mahogany

Livestock use as well as ungulate wildlife (deer and elk) can adversely affect plants of mountain mahogany ability to regenerate by grazing on seedlings and reducing seed production. Maximum use of browse of mountain mahogany is 50 percent utilization. Where livestock grazing occurs at

50 percent use or greater, shrubs may survive but seed production is reduced (Williams 2008). Most stands are mature and have young trees establishing on the outer edges of the stands. A few isolated stands can be affected by cattle loafing or shading under the trees resulting in damage to trees in the stands. These impacts are limited to just a few stands that are generally less than 0.50 acre in size. This level of use is likely not occurring in larger stands of mountain mahogany. Curl-leaf mountain mahogany has the greatest palatability of any browse plant on mule deer range. In most areas, curl-leaf mountain mahogany palatability is rated good or excellent for deer and elk but fair to worthless for cattle, domestic sheep, and domestic goats (Parker 1975).

Cumulative Effects

The cumulative effects areas for this project would include the National Forest System lands within the project area and all private lands within its boundaries. The cumulative effects area allows us to determine these affects for a wide range of species and their habitats. Ongoing activities that are acting cumulatively with livestock grazing to negatively affect uplands are wildfire, activities associated with livestock management, mineral exploration, roads and motorized trails, fuelwood harvest and dispersed and developed camping. Improvement projects have benefited upland communities.

Mining and mineral exploration have historically impacted sagebrush and mountain brush communities in the vicinity of Buckskin Mountain on the West Side Flat Creek and Martin Basin Allotments. These vegetative communities were also historically impacted in the vicinity of Spring City on the Buttermilk Allotment. Road construction, drill sites, and historical mine sites have disturbed these communities and resulted in the alteration of habitats. Less than 25 acres of these communities have been disturbed over the past 5 years.

Historic and potential future livestock developments associated with grazing allotments can have a wide range of potential cumulative effects. Water developments and fences can concentrate livestock and generally increase use levels and disturbance within sagebrush and mountain brush communities. Poor water distribution is the chief cause of poor livestock distribution on most ranges (Holechek et al. 2001). Where available watering points are infrequent, cattle tend to congregate longer usually overgrazing these areas. Heavy grazing in these areas results in the depletion of native vegetation. Areas depleted of native vegetation are susceptible to invasive and noxious weed infestations, soil compaction, and erosion concerns. Another cumulative effect of livestock developments is the creation of trails. If animals must travel large distances between water and available forage, a series of trails would be created that gradually become larger and more numerous (Holechek et al. 2001). Livestock trails are susceptible to soil compaction, erosion, and invasive weed establishment. Livestock developments are located on all allotments within the project area. Livestock developments require yearly maintenance to maintain their functionality. Many of the developments are in remote areas and require the use of roads (for vehicle use) or trails (for horses) to haul tools and materials for maintenance.

Wildfires have had a considerable effect on sagebrush and mountain brush communities. These effects are most evident in all or portions of the Indian, West Side Flat Creek, Quinn River, and Granite Peak Allotments. Wildfire can change the vegetation on these sites and make them more vulnerable to noxious weeds or other impacts. Mountain brush communities often recover quickly following wildfires. Mountain big sagebrush communities often recover following wildfires. Sometimes this recovery can be very slow due to the size and intensity of the fires, and the possible encroachment and dominance of cheatgrass following the fire. Wildfires have impacted mountain mahogany stands on the Indian, West Side Flat Creek, Martin Basin, Rebel Creek, and Granite Peak Allotments. These fires have eliminated or reduced the size of these

stands and removed young plants around the perimeter of many of the old mature stands. Wyoming big sagebrush communities are at greatest risk from wildfire and would generally become heavily infested with cheatgrass following a fire. Although fires have always been a natural occurrence in the Great Basin grasslands, they normally occurred no more than every 60 to 100 years, while cheatgrass has a fire cycle of every 3 to 5 years (Kaczmarski 2000). Native plants cannot recover from such frequent burnings. After a few cycles, a cheatgrass monoculture develops, which further induces the wildfire/annual grass cycle (Kaczmarski 2000).

Prescribed fires and mechanical vegetation treatments such as the Buttermilk Prescribed Burn and the Buttermilk Dixie Harrow treatments have reduced the canopy cover and changed the composition of the vegetative communities within the individual project areas. Sagebrush would reestablish on the sites over time and would result in a diversity of age classes of sagebrush and mountain brush on the sites.

In cooperation with NDOW and BLM, a restoration project will be implemented on the north and west side of the Santa Rosa Ranger District. This project would utilize and maintain existing roads and create a series of “green strips” using fire resistant vegetation that would slow the progression of wildfires. This project is being proposed to help protect critical sagebrush habitat for sage grouse and other upland wildlife species. This project is currently in the planning stages and may be implemented within 2-3 years.

Infestations of noxious weeds occur within all sagebrush community types as well as some mountain brush communities to varying degrees within the project area. Infestations in mountain brush, low sagebrush, and higher elevation mountain sagebrush communities are generally isolated and limited in size. Wyoming big sagebrush and lower elevation mountain big sagebrush communities have more infestations of larger size and are at greater risk for infestation of noxious weeds. Noxious weeds have a competitive advantage in areas where the native bunchgrasses and forbs are stressed and degraded which can result in areas of disturbance. The simplest effect of some invasions is the displacement of native plant species by simple crowding, competition for resources, or other mechanisms (USDI BLM 1998). An aggressive identification and treatment program on the District has minimized the cumulative effects of noxious weeds on these upland vegetation communities.

Dispersed recreation occurs throughout the project area. These activities include camping, day use, hiking, horseback riding, OHV and vehicle use, hunting, fishing, and others. Dispersed use activities in upland vegetation communities can trample or damage vegetation resulting in a decline in condition. These activities can also result in soil erosion at the sites which can affect long-term productivity. Some of the impacts associated with use of vehicles will be addressed through the Travel Management Plan addressed above. Roads, trails, and vehicle use have resulted in impacts to both sagebrush and mountain brush communities throughout the project area. Unauthorized roads can damage vegetation or result in other resource damage that can affect these communities. Once implemented, the Travel Management Plan will prohibit off-road travel by vehicles on the Forest. Prohibiting off road travel by vehicles will reduce these affects on the sagebrush and mountain brush communities. Vehicles will be restricted to designated roads. Impacts to these communities from existing open roads would continue. Recreation can still impact both sagebrush and mountain brush communities throughout the project area through the dispersal of non-native seed that can sprout and spread especially in areas that have been disturbed. Areas that may be disturbed through both human activities and natural events are found throughout the project area. Recreation also has the potential to increase accidental

wildfires that have the potential to affect both sagebrush and mountain brush communities throughout the project area.

Under this alternative, upland vegetation communities would be stable or decline in areas with heavy use.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Sagebrush and Mountain Brush

For Alternative 2 the maximum utilization for each upland community was identified to provide forage for livestock, for healthy plant growth and reproduction, and to allow adequate residual cover for wildlife habitat needs. The maximum utilization values should help ensure that plants would be able to produce adequate root growth to remain vigorous and healthy. Adequate litter to help protect the soil should remain at the end of the grazing season. Increased litter would increase organic matter content in the soil that would improve water-holding capability and, in turn, should improve seedling growth. More vigorous plants would be able to produce more seed, which should increase seedlings and over time increase ground cover by desirable herbaceous species and decrease the amount of bare ground.

If the area is functioning, the maximum utilization would be reduced from 65 to 50 percent for herbaceous use and 35 percent browse for mountain big sagebrush and mountain brush communities. This level of use should allow functioning systems to maintain. Removal of above ground foliage directly affects a plants ability to grow roots. When up to 50 percent of the leaves are removed on a plant, root growth continues unimpaired (Dietz 1988). One study has occurred in mountain big sagebrush and mountain shrub habitat with cattle. At moderate use (35 to 45% use with rest rotation), grazing had no impact on forage production, cover, or species composition for mountain big sagebrush and mountain shrub habitats in fair to good condition after 7 years when compared to no grazing (Laycock and Conrad 1981). Smith and others (2007) note that utilization between 30-50 percent, based upon total annual production, will provide for continued productivity of the range.

In areas where the condition of mountain big sagebrush or mountain brush is functioning-at-risk, the utilization would be further reduced to 50 percent herbaceous and 25 percent browse. Review of existing literature showed that conservative grazing can increase forage production and improve vegetation composition on degraded rangelands (Holechek et al. 1999b). Non-functioning areas would be reduced further. These levels of use should result in maintaining mountain big sagebrush and mountain brush communities that are either functioning-at-risk or non-functioning. However, if areas functioning-at-risk or non-functioning are at that level because of a high canopy cover, a change in livestock management may not restore the community to functioning (review in Laycock 1999). These areas may currently have increased cover of sagebrush but remnants of the perennial grass and forb understory remain and should allow for recovery of this system (Anderson and Inouye 2001, Roberson 1971). The time for recovery will depend on many factors including site capability and other factors such as fire and drought. Those uplands would still require more active management, such as fire or mechanical treatment, to move the area toward functioning. However, livestock use could further reduce the recovery from other disturbances such as fire..

Maximum utilization in Wyoming big sagebrush would be lowered to 40 percent if the community is functioning and 30 percent if functioning-at-risk. Holecheck and others (2004) recommended 30-40 percent use of key species for sagebrush/grassland range types that receive 8-12 inches of precipitation depending on condition (similar to the Wyoming big sagebrush on the Santa Rosa Ranger District). Wyoming big sagebrush typically occurs on drier sites and is less productive than mountain big sagebrush. This type does not respond as rapidly to disturbance as mountain big sagebrush. The understory is highly susceptible to cheatgrass invasion. A healthy understory reduces the risk and increases the likelihood of recovery after disturbance.

Mountain Mahogany

Under Alternative 2, utilization on browse would be reduced from 50 to 35 percent and herbaceous used would be decreased from 65 to 50 percent (Williams 2008). Utilization of browse of mountain mahogany at 35 percent should allow for seed production on mature stems to continue. Seed production is critical to recruitment of mountain mahogany seedlings. Lower herbaceous use should allow from increased seedling survival and improvement of the understory species composition. Most stands are mature and have young trees establishing on the outer edges of the stands. A few isolated stands can be affected by cattle loafing or shading under the trees resulting in damage to trees in the stands. These impacts are limited to just a few stands that are generally less than 0.50 acre in size. The most improvement in condition would be seen in these smaller stands of mountain mahogany.

Cumulative Effects

Cumulative effects would be similar to Alternative 1 but reduced due to the decrease in utilization to manage for ecological condition. Under this alternative, upland vegetation communities would improve with upward trends, but at a slower rate than Alternative 3. Monitoring and continued assessments would identify areas of concern, and procedures outlined in Alternative 2 would ensure an increased rate of recovery.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Sagebrush and Mountain Brush

Alternative 3 provides for the greatest rate of change towards maintain a functioning condition or improving as functioning-at-risk for the upland vegetative communities. Under this alternative, livestock grazing would not continue. The rate of change would be dependent on the current vegetation condition, presence of noxious or invasive weeds, and the impacts and influences of other management actions and uses within the project area.

With the permanent removal of livestock grazing from the sagebrush and mountain brush communities, areas that are functional would continue to function. Adequate litter would be left every year to provide ground cover to protect soils from erosion and add organic matter. Grasses and forbs would be able to produce seed in adequate quantities to establish new seedlings. The plants on site would continue to reproduce and provide for the desired species composition and density for which the site is capable.

Some areas functioning-at-risk or non-functioning are at new stable conditions and would not show improvement with the removal of livestock (review in Laycock 1999). For example, Wyoming big sagebrush with an understory of cheatgrass may not improve under Alternative 3. The conversion to cheatgrass dominated systems is usually caused by fire; however, grazing may have been an important factor in achieving that condition. Perennial grasses did not increase in basin big sagebrush community after 13 years without livestock grazing (West et al. 1984). Once sagebrush dominates the community and the understory is reduced, other disturbances such as fire may be necessary to restore the system. However, the response can depend on site and past grazing systems. After 22 years without livestock grazing (Holechek and Stephenson 1983), the response of native grasses and shrubs in a degraded basin big sagebrush community depended on the site.

However, some studies indicate recovery with removal of livestock. In a landscape-level study in Idaho, increases of cover of perennial grasses were observed in stressed Wyoming and basin big sagebrush after 25 years (Anderson and Inouye 2001). In Paradise Valley, Nevada, increased perennial forbs and grasses and shrub were observed after 30 years of rest on a degraded sagebrush system (Robertson 1971)

Most of the sagebrush systems are functioning with some areas functioning-at-risk. These areas may currently have increased cover of sagebrush but remnants of the perennial grass and forb understory remain and should allow for recovery of this system. The time for recovery will depend on many factors including site capability and other factors such as fire and drought. Recovery for Wyoming big sagebrush can be seen after about 25 years (Anderson and Inouye 2001, Roberson 1971). The project area is dominated by mountain big sagebrush and mountain brush which is a more productive system in areas with higher precipitation than the previously discussed studies. This system should respond to the removal of livestock grazing quicker than the Wyoming big sagebrush systems.

Over time, this alternative would result in the increase of litter and fine fuels which may contribute to the return of fire to the sagebrush community. In the mountain big sagebrush communities, fire serves as a beneficial mechanism to achieve the desired ecological condition whereas Wyoming big sagebrush communities are much more susceptible to the negative effects of type conversion and noxious weed establishment after fire.

Where the vegetative community is functioning-at-risk, the complete removal of grazing by livestock should provide for an upward trend and improvement in the health of the site through increased productivity or vigor of individual plants, as well as, an increase in the number of plants and a decrease in bare ground due to the entire plant being left as residue. This alternative would improve sites that are currently at risk more quickly than the other two alternatives.

Mountain Mahogany

Under Alternative 3, most mountain mahogany stands would see little to no change due to the minimal impacts of livestock grazing. After removal of grazing, the condition of the few mahogany stands that are currently being impacted by grazing would improve due to the increased regeneration by mountain mahogany seedlings and improved understory composition.

Cumulative Effects

Under Alternative 3, most of the other management actions and uses that currently occur on the Santa Rosa Ranger District would continue resulting in impacts on upland vegetation resources.

The total cumulative effects on vegetation resource would generally be reduced as the potential impacts of livestock grazing would no longer occur.

Noxious Weeds

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Under Alternative 1, noxious weed infestations may continue to increase slowly in size and disperse from the originating site. Treatment of noxious weeds would still occur. Livestock grazing affects noxious weeds by both serving as a vector to introduction new populations and species, as well as creating conditions that may contribute to weed establishment.

Cattle may disperse seeds by picking up seed and ingesting seed (Chambers and MacMahon 1994, Olsen 1999). In addition, permittes may use OHV or other means for permit administration. The permittees may travel along roads as well as off-road. Vehicles (OHV, cars, trucks, etc.) contribute to the movement of noxious weed infestations on the Santa Rosa Ranger District.

Locations along cattle trails and near cattle congregation areas within the project area provide ideal areas for noxious weed establishment. Within these locations, there is soil disturbance and reduced competition from native vegetation (Olsen 1999). Degraded or stressed plant communities can provide open habitat or sites for the establishment of noxious weeds. Many of these sites are located on riparian areas, dry benches adjacent to streams, salting locations, roadsides, trails, or areas around water developments. In riparian areas with 65 percent use, functioning at risk communities may continue to decline. This would create habitat for invasion and spread of noxious weed.

Cumulative Effects

The resulting spread of noxious weeds from wildfires is the largest source of cumulative effects. Wildfires on the Indian, West Side Flat Creek, Granite Peak, and Quinn River Allotments have created an environment where noxious weeds have spread and thrived . Infestations in these areas have been dominated by Scotch thistle, Canada thistle, and hoary cress. In Wyoming big sagebrush, some areas have been invaded by cheatgrass with recent fires and are susceptible to medusahead. An aggressive identification and treatment program on the District has minimized the continued spread of noxious weeds. After recent fires (North Road and Upper Willow Creek), seeding of native herbaceous perennials has occurred to reestablish ground cover. This helps prevent the spread of noxious and invasive weeds. Other activities contribute to cumulative effects by providing vectors for transport and new ground disturbance but on a more localized scale.

Roads, trails, mines, livestock ponds, salting sites, etc., create soil disturbance that can easily become infested by noxious weeds. Livestock, wildlife, road maintenance, and vehicles (OHVs, cars, trucks, etc.) contribute to the movement of noxious weed infestations on the Santa Rosa Ranger District. Noxious weed seed, such as hoary cress, is easily dispersed along roadways and can spread quickly along these routes. New weed infestations are easily located along roads and can be treated efficiently (Gelbard and Belnap 2003, Schmidt 1989). The key is early detection and treatment.

Mining and mineral exploration in the vicinity of Buckskin Mountain on the West Side Flat Creek and Martin Basin Allotments and near Spring City on the Buttermilk Allotment have historically created large areas of disturbance where noxious weeds can establish. Scotch thistle and hoary cress have become established along access roads in the National Mining District on the west side of Buckskin Mountain. A single location of yellow toadflax has been identified and treated within the historic Spring City mining site. Future mineral development would create areas of disturbance where noxious weeds may become established. Vehicle traffic associated with exploration can be a vector for dispersal of seed.

Historic and potential future livestock developments associated with grazing allotments can create areas of disturbance where noxious weeds can become established. Noxious weed locations associated with allotment developments are currently limited to a few isolated locations; however, there is potential risk for future infestations.

Dispersed recreation and special use activities such as outfitter and guides occur throughout the project area. These activities include camping, day use, hiking, horseback riding, OHV and vehicle use (addressed above), hunting, fishing, and others. Dispersed use activities can create disturbed sites and bare ground where noxious weeds can become established. Weed seed can be accidentally transported into an area resulting in a new noxious weed infestation. These activities are of particular concern as many of these visitors often come from areas in other parts of Nevada or from other states introducing new species. These visitors can transport new weeds into an area which pose an additional risk to vegetative communities.

Prescribed fires and mechanical vegetation treatments such as the Buttermilk Prescribed Burn and the Buttermilk Dixie Harrow treatments disturb soils and provide a potential source for noxious weed infestations. These treatments followed appropriate best management practices to minimize the risk for noxious weed infestations. Treatment areas will be monitored annually to ensure that no weed infestations are identified. If infestations are identified, noxious weed treatments would be initiated.

Compared to Alternative 2 and 3, livestock grazing would continue to provide a source of disturbance and vector for weed movement across the project area. Communities functioning at risk would continue to improve making the systems less susceptible to invasion and spread of noxious weeds particularly after disturbances such as wildfire.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Under Alternative 2, vegetative communities should move in an upward trend to functioning. The riparian areas, especially seeps, springs, and meadows, that are functioning at risk should improve in condition. Reduce utilization would minimize physiological impact on native plants and minimize soil disturbance (Olsen 1999) which would increase ground cover and shading of the soil. Increased cover of native plants reduces the likelihood of invasion from noxious weeds (Anderson and Inouye 2001). However, cattle may continue disperse seeds by picking up seed and ingesting seed. Activities associated with permittee administration such off road use of vehicles would continue. Locations along cattle trails and near cattle congregation areas within the project area provide areas for noxious weed establishment.

Cumulative Effects

The cumulative effects of Alternative 2 related to noxious weeds would be similar to those effects disclosed for Alternative 1. Compared to Alternative 1, this alternative would result in a reduction in the risk of noxious weed infestations due to livestock.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock grazing would be eliminated. After removal of grazing, there would no longer be areas of soil disturbance resulting from livestock grazing activities. Activities associated with permittee administration would not continue. With fewer areas of disturbance and increased ground cover, there would be a reduction in the potential for new noxious weed infestations.

Cumulative Effects

The potential cumulative effects related to the various programs, projects, and actions described above would be similar to those effects disclosed under Alternatives 1 and 2. Because the impacts of livestock grazing would be eliminated under this alternative, the potential cumulative effects would be reduced.

Alternative 3 would result in the least risk associated with noxious weed infestations of the three alternatives since livestock grazing would no longer provide a source of disturbance and vector for weed movement. Communities functioning at risk would improve making the systems even less susceptible to invasion and spread of noxious weeds particularly after disturbance such as wildfire.

Forest Service Sensitive Plant Species

ALTERNATIVE 1 – Current Management

Effects Common to All Species

Direct and indirect effects of livestock grazing include impacts to individual plants and alteration of the physical environments and surrounding plant communities. Direct impacts from livestock include trampling, compacting soil by hoof actions, and removal of plant materials. Under heavy grazing, plants show a loss of vigor and reduction of reproduction activity (Stoddart et al. 1975, pg. 104-145). Livestock can also alter the physical environment by urine deposition and other excretion (Day and Detling 1990). Additionally, indirect impacts such as reduction in soil water infiltration, soil compaction, soil erosion, noxious weed introduction, changes in the seed bank, reduction in soil litter, loss of the cryptogrammic crust, and effects to pollinators would continue (Belnap et al. 2001; Stoddart et al. 1975, pg. 104-145; Vallentine 1980, pg. 32-33). The direct and indirect effects can cause a modification or loss of potential habitat for rare plant species that would be greater in areas where cattle congregate (Stoddart et al. 1975, pg. 280-286).

Changes to the plant community can affect the competitive environment of a rare plant species. Livestock grazing can cause alteration of species composition of the community, alteration of ecosystem functions, and alteration of ecosystem structure (Fleischner 1994, Huntly 1991, Yensen 1981). In low-nutrient environments like the semi-arid Great Basin, grazing can also decrease plant diversity (Proulx and Mazumder 1998, Waser and Price 1981), but not in all cases

(Rambo and Faeth 1999). Preferential grazing can decrease palatable species and plants susceptible to grazing injury, resulting in decreased competition for less desirable and more resistant plants (Stoddart et al. 1975, pg. 268-270). In sagebrush steppe, grazing can increase shrub cover, decrease palatable forbs and grasses, and introduce invasive weeds resulting in a change to the structure and species composition of a plant community (Saab et al. 1995; Vallentine 1980, pg. 40-41; Young et al. 1979). Similar processes are seen in all plant communities. Determining the effects to a single species can be difficult without documentation of effects to the species and responses to grazing although some general assumptions can be made. Rare plants with sparse distributions have shown similar responses to grazing and other disturbances as more common species, although the rare species were more sensitive to disturbance (McIntrye and Lavorel 1994). Predictions about responses to grazing may also be made based on growth form (McIntrye et al. 1995).

Osgood Mountain Milkvetch

Direct and Indirect Effects

Direct and indirect effects could occur to Osgood Mountain milkvetch from grazing as described previously. The species is found in flat and gentle slopes in sagebrush steppe vegetation and loose silty soils on moderate south slopes. Approximately 3,792 acres of potential habitat are found within the Santa Rosa Ranger District with 1,911 acres occurring in the project area.

Grazing occurs in many of the populations of Osgood Mountain milkvetch. In Nevada, grazing occurs in the populations on BLM lands, but use is limited. Osgood Mountain milkvetch has persisted and appears stable (Juncosa 1997). Most populations in Idaho have also experienced livestock grazing (Mancuso and Moseley 1993).

Direct impacts from herbivory are not expected and herbivory does not appear to harm individual plants (Knight 1991, Mancuso and Moseley 1993). Trampling or uprooted plants have been observed in occupied habitat (Mancuso and Moseley 1993). Indirect impacts from livestock grazing include habitat degradation due to overgrazing, affects on pollinators, and associated management activities (Mancuso and Moseley 1993). Livestock grazing could increase the introduction and spread of invasive including cheatgrass and noxious weeds into potential habitat.

In the upland habitats, utilization levels of a maximum of 65 percent may negatively impact the habitat, especially in areas near water. These habitats would receive limited use by livestock unless activities were concentrated. Most utilization standards in uplands are generally not reached (see Upland Vegetation). In these upland habitats, utilization levels of near the maximum level of 65 percent can occur, especially near water and activities that concentrate livestock. Steeper slopes and increased distance to water results in less livestock use. In these localized areas or if distribution practices changes, utilization at 65 percent of herbaceous understory vegetation may have a negative impact to upland communities (see Upland Vegetation). In sagebrush steppe, grazing can increase shrub cover, decrease palatable forbs and grasses, and introduce invasive weeds resulting in a change to the structure and species composition of a plant community that may alter the competitive environment for Osgood Mountain milkvetch. As a result, there may be a reduction in the amount of herbaceous understory vegetation, increased occurrence of bare ground and the potential for invasive species to establish in the potential habitat. Impacts can depend of the season of use and type of livestock.

In addition, concentration activities can negatively affect the potential habitat (Mancuso and Moseley 1993). Livestock management activities such as roads, water pipelines, and fence construction have impacted known populations. Concentrating activities increase trampling to plants, increase use of the herbaceous understory vegetation, increase soil disturbance and compaction, and increase likelihood of introduction and spread of noxious and invasive weeds. In addition, livestock congregation areas can negatively impact the potential habitat.

Design features would require surveys and monitoring in potential habitat before activities that concentrate use can occur (e.g., salt blocks). If surveys find occupied habitat and monitoring indicates negative impacts from livestock, grazing would be modified to minimize negative impacts to the species populations.

Cumulative Effects

Cumulative effects have occurred in the potential habitat of Osgood Mountain milkvetch including activities that cause the loss or modification of potential habitat. Generally, known impacts and major threats including mineral exploration and development, road maintenance and off-road vehicles use, trampling by livestock and feral animals, and competition from invasive weeds (Morefield 2001) have occurred in potential habitat on the Santa Rosa Ranger District. Much of the potential habitat for Osgood Mountain milkvetch occurs in the Santa Rosa-Paradise Peak Wilderness, which would limit the cumulative effects to potential habitat especially from development and mining.

Compared to Alternative 2 and Alternative 3, grazing would be much higher in these potential habitats, and therefore, the impacts from grazing would be greater in the potential habitat. Concentrating activities would be reduced. Although this alternative would impact individuals and potential habitat, it is not expected to affect the viability of the species.

Obscure Scorpion Plant

Direct and Indirect Effects

Direct and indirect effects could occur to obscure scorpion plant from grazing as described previously. Approximately 65,609 acres of potential habitat are found within the Santa Rosa Ranger District with 44,585 acres occurring in the project area.

Observations suggest that this plant is an early to mid-seral species that is fire adapted (Holland 1996) and found in both aspen stands and upland habitats. Grazing is currently not permitted for 2 years after a burn. This should allow any potential population to become established before livestock grazing is reintroduced.

Direct and indirect effects could occur to obscure scorpion plant and its habitat from grazing as described previously. Obscure scorpion plant is a small annual such that direct impacts would be limited with most effects occurring because of modification of the habitat and surrounding plant community. Some populations of obscure scorpion plant are subjected to grazing and the species is maintaining at the sites (Mosely 1989; Murphy 2002; R. Bryan, personal communication). Livestock and wildlife trailing appear to create openings in the vegetation used by this species (Murphy 2002). Heavy or excessive grazing is likely to increase trampling of plants, but also increases the risk of infestation of invasive species such as cheatgrass (Murphy 2002). Many invasive species are annuals with life histories similar to obscure scorpion plant and may complete directly with individuals plants or degrade the habitat.

The mountain big sagebrush habitats would receive limited use by livestock unless activities were concentrated. However, aspen communities in the Santa Rosa Ranger District are currently utilized by livestock especially in the periphery. Deer, elk, and livestock grazing in this community can affect the understory species and perpetuate the occurrence of less desirable or less palatable perennials and annuals (Kay and Bartos 2000, Mueggler 1988). In aspen communities, livestock tend to congregate (see Aspen Vegetation). On the Santa Rosa Ranger District, aspen habitats are often found in seasonal moist sites and near water.

For upland habitats (sagebrush and aspen) associated with obscure scorpion plant, current utilization standards of 65 percent of herbaceous vegetation would continue. Where it occurs, utilization levels near the maximum of 65 percent in upland and aspen vegetation may negatively impact habitat, especially near water. For mountain big sagebrush and mountain brush, this impact would be localized as most upland utilization standards are generally not reached (see Upland Vegetation). If distribution practices change, utilization of 65 percent of herbaceous understory in sagebrush and mountain brush vegetation may have a negative impact to upland communities (see Upland Vegetation). In sagebrush steppe, grazing can increase shrub cover, decrease palatable forbs and grasses, and introduce invasive weeds resulting in a change to the structure and species composition of a plant community that may alter the competitive environment for obscure scorpion plant. In aspen, higher utilizations could affect smaller stands, leading to the loss of clones and habitat degradation for species found associated with aspen (see Aspen).

For obscure scorpion plant, the plant and habitat appear to tolerate grazing and may even benefit from light grazing (Holland 1996, Moseley 1989, Murphy 2002). However, conservation recommendations often include eliminating activities that would concentrate large numbers of livestock within or adjacent to occupied habitat (Holland 1996, Murphy 2002). Concentrating activities can negatively impact the potential habitat. Holland (1996) suggests that grazing should be limited to dispersed grazing activity in and near known populations. Concentrating activities increase trampling to plants, use of the herbaceous understory vegetation, soil disturbance and compaction, and the likelihood of introduction and spread of noxious and invasive weeds. Design features would require surveys and monitoring in potential habitat. To prevent these negative impacts, concentrating activities (e.g., placement of salt blocks, watering sources, or other range supplements) would be prohibited within any known population and potential habitat until surveyed.

Cumulative Effects

The cumulative effects area for this project would include the entire Santa Rosa Ranger District and all private lands within its boundaries. Cumulative effects have occurred in the potential habitat of obscure scorpion plant including activities that caused the loss or modified the habitat. Generally, known impacts and major threats including mineral exploration and development, fire suppression and catastrophic fire, trampling by livestock and feral animals, and competition from invasive weeds (Morefield 2001) have occurred in potential habitat on the Santa Rosa Ranger District. Woodcutting in aspen stands may affect potential habitat for obscured scorpion plant. Inappropriate or illegal woodcutting techniques and vehicle use may also damage aspen stands and alter the habitat. Dispersed campsites are often placed in aspen stands, which can impact obscured scorpion plants and its habitats. All grazing allotments on the Santa Rosa Ranger District have potential habitat. On the Lamance, North Forest, Paradise, Quinn River, and Wild Bill Allotments, concentrating activities in potential habitat would continue to occur.

Compared to Alternative 2 and Alternative 3, grazing would be much higher in these potential habitats and therefore, the impacts from grazing would be greater in the potential habitat. Concentrating activities would be reduced as in Alternative 2. Although this alternative would impact individuals and potential habitat, it is not expected to affect the viability of the species.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Effects Common to All Species

Under Alternative 2, the effects would be similar to Alternative 1 but reduced. Direct and indirect effects from trampling, herbivory, and changes in the plant community should be reduced but would still occur.

Osgood Mountain Milkvetch

Direct and Indirect Effects

Direct and indirect effects from Alternative 2 could occur to Osgood Mountain milkvetch from grazing but would be reduced compared to Alternative 1. Utilization levels of 50 percent in upland vegetation would allow vegetation to improve and minimize effects to Osgood Mountain milkvetch (see Upland Vegetation).

Osgood Mountain milkvetch would occur in the mountain big sagebrush (from Idaho) or low sagebrush (from Nevada) vegetation types. The objectives for these systems are described in the Matrices (Appendix A). Desired conditions should provide suitable habitat for this species especially related to sagebrush cover and understory condition. For mountain sagebrush vegetation types, a functioning system would minimize bare ground, decrease non-native and annual grasses, and decrease noxious weeds. By achieving the desired condition, the understory would have an increased diversity of forbs to grasses, which would include Osgood Mountain milkvetch.

Utilization levels of 50 percent would allow the habitat to function as desired and minimize effects to Osgood Mountain milkvetch. However, concentration activities can negatively impact the potential habitat. Design features would require surveys and monitoring in potential habitat before allowing activities concentrating use (e.g., salt blocks and water developments). If surveys find occupied habitat and monitoring indicates negative impacts from livestock, grazing would be modified to minimize negative impacts to the species populations.

Cumulative Effects

Cumulative effects would be similar to Alternative 1. Grazing would be reduced in the potential habitats, and therefore, the impacts from grazing would be less in the potential habitat. Concentrating activities would be reduced. Although this alternative would impact individuals and potential habitat, it is not expected to affect the viability of the species.

Obscure Scorpion Plant

Direct and Indirect Effects

Direct and indirect effects from Alternative 2 could occur to obscure scorpion plant from grazing but would be reduced compared to Alternative 1. Utilization levels of 50 percent in upland

vegetation would allow the vegetation to improve and minimize effects to obscure scorpion plant. Utilization in the aspen communities would be reduced to 20 percent on available suckers or up to 45 percent on herbaceous material depending on condition. This would allow the aspen plant communities to show a stable or increasing trend. The time cattle are in the aspen habitat and the direct and indirect effects as described under Alternative 1 would be decreased.

Obscure scorpion plant would occur in the mountain big sagebrush and mountain brush vegetation types as well as the edges of the aspen vegetation types. The desired conditions for these systems are described in the Matrices (Appendix A). If the habitat is functioning, the conditions should provide suitable habitat for this species by providing a healthy herbaceous understory. For mountain sagebrush and mountain brush vegetation types, a functioning condition would decrease non-native and annual grasses and noxious weeds. If cheatgrass invades the site, it could alter the fire intensity and frequency, and eventually convert the site to an annual grassland as well as compete directly with obscure scorpion plant. By achieving the desired condition, the understory would have an increased diversity of forbs to grasses, which would include obscure scorpion plant. Some light disturbance including fire would be allowed to occur.

For aspen vegetation types, the desired condition would also decrease non-native species, annual grasses, and noxious weeds. Weedy species would occupy the same microsite as obscure scorpion plant and possibly compete directly with the individual plants or degrade the habitat. If desired conditions are being met, the aspen stand should be reproduce and maintain the vegetation type over time, therefore, continuing to provide potential habitat for obscure scorpion plant.

As described under Alternative 1, concentrating activities can negatively impact potential habitat. In aspen communities, livestock tend to congregate. Aspen on the Santa Rosa District is often found in seasonal moist sites and near water. Holland (1996) suggests that grazing should be limited to disperse grazing activity in and near known populations. Placement of salt blocks, watering sources, or other range supplements likely to concentrate animals in small areas, should be prohibited within any known population. Design features would require surveys and monitoring in potential habitat before allowing activities concentrating use (e.g., as salt blocks). If surveys find occupied habitat and monitoring indicates negative impacts from livestock, grazing would be modified to minimize negative impacts to the species populations. Some populations of obscure scorpion plant are subjected to grazing and the species is maintaining at the sites (Mosely 1989, R. Bryan, personal communication).

Cumulative Effects

Cumulative effects would be similar to Alternative 1 but reduced due to the reduction in utilization to manage for ecological condition. However, some potential habitat may have crossed thresholds with increased canopy closure and type conversions (i.e., cheatgrass and invasions of noxious weeds) and would not be affected by the removal of grazing.

Compared to Alternative 2, grazing would be reduced in these potential habitats and therefore, the impacts from grazing would be less in the potential habitat. Concentrating activities would be reduced. Although this alternative would impact individuals and potential habitats, it is not expected to affect the viability of the species.

ALTERNATIVE 3 – No Grazing/No Action

Effects Common to All Species

Alternative 3 would provide the greatest protection for sensitive and rare plant habitat for the long-term viability of these rare populations. Under Alternative 3, livestock use would no longer continue and would provide for long-term protection for potential habitat. Habitat condition improvement would continue at the fastest rate. Direct impacts such as trampling, herbivory, and disruption of seed bank stability, and indirect impacts associated with livestock use and associated activities would no longer occur. As a result, soil compaction, introduction of noxious weeds by livestock, and decreased soil moisture would be substantially reduced and/or eliminated.

Osgood Mountain Milkvetch

Direct and Indirect Effects

Direct and indirect effects from grazing would no longer occur to Osgood Mountain milkvetch. Upland vegetation would improve at a higher rate than Alternatives 1 and 2 (see Upland Vegetation section). Livestock congregation areas would be eliminated in potential habitat.

Cumulative Effects

Cumulative effects would be similar to, but reduced from, Alternatives 1 and 2. The trend and rate of recovery may be accelerated under Alternative 3. However, some potential habitat may have crossed thresholds with increased canopy closure and type conversions and would not be affected by the removal of grazing. The long-term benefits of no grazing within the project area would improve the viability of the habitat and enable the Humboldt- Toiyabe National Forest to better meet viability requirements for rare and sensitive plants.

Obscure Scorpion Plant

Direct and Indirect Effects

Direct and indirect effects from grazing would no longer occur to Obscure scorpion plant. Upland vegetation would improve at a higher rate than Alternatives 1 and 2 (see Upland Vegetation section). Improvement in potential habitat would be on the edge of the smaller aspen communities. Livestock congregation areas would be eliminated.

Cumulative Effects

Cumulative effects would be similar to, but reduced from, Alternatives 1 and 2. The trend and rate of recovery may be accelerated under Alternative 3. However, some potential habitat may have crossed thresholds with increased canopy closure and type conversions (i.e., to cheat grass) and would not be affected by the removal of grazing.

Issue 5: SOCIO-ECONOMIC VALUES

EXISTING CONDITION

This section presents a description of existing conditions for social and economic values found within the project area. This description provides the basis for assessing the projected socio-economic effects of the alternatives as follows.

County Overview

The entire Martin Basin Rangeland Project Area lies within Humboldt County which has an estimated population of 17,129 (US Census Bureau 2005). Winnemucca, the county seat, is the largest community within the County. In 2005, Winnemucca's estimated population was 7,726. In 2005, the labor force within the County was estimated at 7,764, and the total full and part-time employment was 1,018 people (US Census Bureau 2005). There were 1,392 jobs attributed to mining. Farm employment accounted for 543 jobs or approximately 5 percent of the total employment (Headwaters Economics 2007).

Humboldt County is the leading agricultural county in the state of Nevada (Humboldt County Nevada Online 2008) and ranked sixth in the State for the value of livestock and poultry sold (USDA Census of Agriculture 2002). The total value of agricultural products sold was $54,949,000 of which cattle accounted for $16,346,000 or approximately 30 percent (USDA Census of Agriculture 2002).

Historical Background

Livestock grazing is recognized as an important multiple use on the Santa Rosa Ranger District. Historically, livestock grazing permits were issued after the establishment of the National Forest System, but not before thousands of sheep, cattle, and horses grazed the range to poor condition. Sheep bands entered the area from California in the late 1880s looking for productive range. Due to great concern by the local ranchers, livestock grazing permits were issued, and the permit system was in effect by the spring of 1912 (Wilcox 1967).

Prior to the establishment of the Santa Rosa National Forest in 1911, the Humboldt County Assessor's Office records indicate there were 16,000 cattle, 1,500 horses, and 150,000 sheep grazing the Santa Rosa Mountain Range. The grazing permits issued in 1912 included sixty-two permittees holding either term or temporary permits for 13,585 cattle, 67,050 sheep, and 1,051 horses. In addition, private land permits for 1,009 cattle and 4,541 sheep were issued to twelve individuals. By 1920, grazing allotments were established and stocking rates were reconsidered due to the poor condition of the range. Great quantities of topsoil were lost from trampling and wind erosion, and many dominant plant species disappeared from the range. Through voluntary and forced reductions, permitted numbers were reduced to 12,000 cattle and 30 horses. The last sheep permit was exchanged for a cattle permit in 1960 (Wilcox 1967).

Intensive management was initiated on the Santa Rosa Ranger District with rest rotation and deferred rotation grazing systems implemented in the late 1960s and early 1970s.

Current Operations within the Project Area

The project area contains eight allotments of which two are currently vacant. Eleven permittees graze 5,305 head of cattle. Total permitted number of animal unit months (AUMs) associated with the 5,305 head of cattle is 27,258 AUMs (Table 43).

The permittees live in the communities of Paradise Valley, Orvada, and McDermitt, Nevada. Ranch communities, like these, generally inhabit small historic Nevada towns, where living a western lifestyle started many generations ago. The permittees use public land to assist and maintain their livestock operations.

One way of addressing the economic value of grazing on National Forest System lands to Humboldt County would be through an estimated value per AUM to the permittee. In 1997, the direct value of one AUM was estimated at $24.40. The total value of an AUM including indirect and induced impacts was estimated at $40.40 (Resource Concepts Inc. 2001). The annual direct value of the permitted number of AUMs (27,258) would be $665,000 with a total economic value of $1,101,000.

Permittees pay the federal government to graze on the eight allotments. Over the past 5 years, total grazing fees have averaged approximately $26,000 a year. The Forest Service collects grazing fees ($1.42/AUM in 2007) from permittees each year. Approximately 50 percent of the fees collected go to the Federal Treasury and the remaining 50 percent is usually returned to the Forest as Range Betterment Funds. Range Betterment Funds are utilized to finance range improvement projects designed to improve rangeland health and livestock management.

Table 43. Current Livestock Management.

ALLOTMENTS	PERMITTED NUMBERS	PERMITTED HEAD MONTHS	PERMITTED AUMS**
Bradshaw	Vacant	Vacant	0
Buffalo	255 C/C*	705	930
Buttermilk	1,303 C/C total 824***	5,655 total 3,576***	7,464 total 4,720***
Granite Peak	1,050 C/C	4,591	6,060
Indian	301 C/C	1,059	1,398
Martin Basin	1,935 C/C	7,346	9,685
Rebel Creek	Vacant	Vacant	0
West Side Flat Creek	461 C/C	1,303	1,721
Total	5,305	20,659 C/C	27,258

* Cow/calf pair.
** Animal Unit Months.
*** Unallocated livestock numbers, head months, and AUMs.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

There would be no changes to the term grazing permits under this alternative. Current management would remain the same. Because no changes in livestock management, utilization levels, or permitted numbers are anticipated under this alternative, this alternative would not impact the current level of livestock management. As permits expire they would be renewed under the same terms and conditions that are presently in effect. Maximum utilization standards would remain as described in the existing Forest Plan. This alternative would not change the current economic status of the existing permittees.

The economic value of the permitted livestock that graze in the project area would not be affected as a result of this alternative. Using the per AUM amount of $40.40 (Resource Concepts Inc. 2001), the annual direct value of the permitted number of AUMs would be $665,000 with a total annual economic value of $1,101,000. The amount of grazing fees received would not be impacted by this alternative. The United States Treasury would continue to receive approximately $26,000 annually in grazing fees from the Martin Basin Rangeland Project Area.

The permittees use public land to assist and maintain their livestock operations. As described above, this alternative should continue contributing economic value to the permittees and their ranches, which should continue to contribute to supporting the economy and rural ranching culture in Humboldt County.

Cumulative Effects

Federal land management policies have the potential to affect the amount of lands available for livestock grazing. However, in the near future it is unlikely there would be any changes in policies that would reduce the amount of available lands on the Santa Rosa Ranger District.

Wildfires that occur frequently on the District may lead to some short-term closures, 2 years minimum, as lands are rested after these fires to allow for vegetation recovery. Once recovery has been completed, the lands would be made available for grazing once again. During these short-term closures, there would likely be a small reduction in the amount of available grazing.

Recent acquisitions of private inholdings within the Santa Rosa Ranger District have slightly increased the amount of National Forest System lands available for domestic livestock grazing. Over time the amount of National Forest Systems lands available for livestock grazing within the project area is expected to remain constant. By maintaining National Forest System lands available for grazing the lands would contribute to continued production of livestock.

In addition to the effects created by the Forest Service permit system, there are numerous outside influences which can affect the viability of individual ranch operators. These influences include worldwide demand for beef products, market prices for livestock, amount of borrowing, production costs, amount of outside supplemental income that ranches bring in, and the cost of labor. These factors can combine to affect the overall viability of each operator. When it is no longer economically viable to continue ranching the ranch property may be sold and converted to other uses.

Over the foreseeable future a loss of working ranches within the permittee group is not expected. The overall livestock industry is presently strong, with producers receiving good prices for cattle and calves sold

The same factors that affect the economic viability of ranching in Humboldt County also would affect the stability of the ranching culture as well. By maintaining the current number of working ranches, the ranching culture should be maintained. There is limited demand in Humboldt County for purchasing ranches for second homes or subdivisions.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Alternative 2 is not initially proposing any changes in numbers or season of use presently permitted. Maximum utilization standards would be reduced so that no proper use criteria (utilization level) exceeds 50 percent utilization.

Upon expiration, permits would be renewed, and depending on the individual permit, utilization levels may be lowered. Updated Allotment Management Plans (AMPs) and Annual Operating Instructions (AOIs) would guide livestock management on each allotment. Any reductions or increases in numbers or season of use and other changes to grazing practices would be determined by monitoring the functionality and ecological health of the rangeland.

Management changes developed in response to allotment monitoring could have an impact on the level of livestock management. The amount of time the permittees spend managing their livestock may increase under this alternative. Permittees may be required to meet stricter proper use criteria in some riparian and meadow communities or uplands. Adding pastures or changing pastures within an allotment may also require additional management time. These and other management changes would likely lead to increased costs.

Early livestock removal from a given pasture or allotment would be required if proper use criteria (allowable utilization levels) are met and there are no other areas to which the livestock can be moved. Incorporating the use of the Bradshaw and Rebel Creek Allotments, which are both currently vacant, would give the permittees additional forage and reduce the potential for early removals.

Overall, there is the potential reduction for the total amount of annual actual use (measured in AUMs). However, the proactive and flexible management that is part of this alternative would make any reductions in AUMs unlikely. The ability to use the two vacant allotments, Bradshaw and Rebel, would also buffer any possible reductions in use. Using the per AUM amount of $40.40 (Resource Concepts Inc. 2001), the annual direct value of the permitted number of AUMs would be $665,000 with a total annual economic value of $1,101,000.

The United States Treasury would continue to receive approximately $26,000 annually in grazing fees from the Martin Basin Rangeland Project Area.

This alternative is not initially proposing any changes in numbers or season of use presently permitted. Upon expiration, permits would be renewed. Updated AMPs and AOIs would guide livestock management on each allotment. Any reductions or increases in numbers or season of use would be determined by monitoring to determine the functionality and ecological health of the rangeland.

The permittees use public land to assist and maintain their livestock operations. While this alternative may create additional costs and lead to reduced production for some permittees as described in the economic section above, the changes are not expected to dramatically reduce the economic value to the permittees and their ranches, which should continue to contribute to supporting the economy and rural ranching culture in Humboldt County.

Cumulative Effects

Cumulative affects are similar to Alternative 1, but to a slightly greater magnitude.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock grazing would cease immediately, eliminating all permitted livestock grazing in the project area. This alternative would likely cause the greatest impact on the level of livestock management. Ranchers that find other forage for their cattle would likely have a higher level of management, while other ranchers who cannot maintain their herds would see a decrease in the level of required management. The rural ranching communities have come to view livestock grazing on public lands as not only a necessary commodity to their small rural communities but as a time-honored use that has become a fundamental part of their community's social fabric and well being.

This alternative would have the largest economic impact on all permittees within the project area. The potential reduction or loss of cattle grazing on National Forest System lands would be 20,659 head months or 27,258 AUMs ($665,000 with a total annual economic value of $1,101,000). The sale and export of raised livestock by the producers previously grazed on the Martin Basin Rangeland Project Area would continue at a reduced level. These reduced sales would still contribute to the total value of agricultural products sold from Humboldt County. The United States Treasury would lose approximately $26,000 annually in grazing fees from the Martin Basin Rangeland Area.

The permittees use public land to assist and maintain their livestock operations. Without this use, ranchers may not be able to sustain a profitable operation and may not be able to afford the costs of leasing private land or purchasing more property to feed their cattle. Ranches with access to substantial private land pastures and BLM allotments would likely be able to continue ranching. Those with limited opportunities may be unable to continue ranching. In the long-term, there could be a small decrease in the number of ranches operating adjacent to the project area. Subsequently a reduction in the number of operating ranches translates into fewer ranching families, fewer working cowboys, and ultimately, a reduction in the ranching culture that typifies the western landscape. This reduction in ranching activities would result in lower economic contributions to Humboldt County. There is the possibility that defunct ranches would be sold and utilized in different fashions such as second homes or subdivisions as is common in other areas of the West. Conversely, some of these purchased ranches may be operated as working cattle ranches by a different operator.

Cumulative Effects

Under Alternative 3, all 190,000 acres of National Forest System lands in the project area would be closed to domestic livestock grazing. This closure would result in an annual loss of 27,258 AUMs from the project area.

Because all permits on National Forest System lands would be canceled, there is the possibility that some of the affected ranchers would be unable to maintain economically viable operations with lands that would remain available for grazing (i.e., private and BLM administered lands). When combined with other factors that affect ranch viability such as market prices for cattle and the cost of labor, it is likely there would be a decline in the number of working ranches adjacent to the project area. Out of the 11 permittees that could be affected it would be difficult to predict how would be affected to this degree.

If under this alternative there is a decrease in the number of working ranches, one would also expect to see a slight decrease in the number of ranch families and cowboys that were associated with the ranches that would no longer be operational. Over time, the visibility of the ranching lifestyle and culture in Humboldt County would be slightly reduced.

OTHER RESOURCE CONCERNS

CULTURAL RESOURCES

EXISTING CONDITION

Cultural resources are the fragile and nonrenewable remains of human activity. They consist of historic sites, architectural sites, archaeological sites, and traditional lifeway values and places of traditional cultural use, all of which are important in past and present human events[13].

Cultural resources are managed through the National Historic Preservation Act (NHPA) of 1966. Before approving ground disturbing projects, the Forest Service takes inventory of cultural properties, determines their eligibility on National Register of Historic Places, and considers the effects of the proposed undertaking through the consultation process in Section 106 of NHPA. This process is executed in agreement with 36 CFR. Once documented, effects to the sites are either avoided or the site is mitigated prior to project initiation. Avoidance of an effect is preferred over mitigation.

Cultural resources on the Santa Rosa Ranger District are richly varied and widely dispersed. Surveys or inventories have been conducted in the project area since the late 1970s. Of the 190,000 acres in the project area, it is likely that one percent or less has been inventoried or surveyed. Native American properties and paleontological resources have not been systematically inventoried. No traditional Native American cultural use properties have been documented for the project area, although the existence of these properties is known from oral tradition and continued practice. Most of the 125 sites that have been identified are prehistoric in nature, 13 are historic in nature, and 4 have both prehistoric and historic elements. The cultural resource sites represent a variety of types, from lithic scatters, quarries, rock shelters, pictograph panels, and hunting blinds to historic military camps, historic roads, town sites, mine sites, and stage routes. The results of cultural resource inventories and additional background information

[13] Traditional lifeway values and places of traditional cultural use are a specific group's traditional system of religious belief, cultural practices, or social interaction, and these lifeway values may or may not be associated with specific locations.

for the Martin Basin Rangeland Project Area are contained in the Cultural Resource Specialist Report.

Livestock grazing on the Santa Rosa Ranger District has been ongoing for well over 100 years. The Forest began dispensing grazing permits in 1912 for sheep, cattle, and horses. Grazing has a definite and documented effect to cultural properties on the allotments. Trampling, artifact breakage, soil compaction, destabilization of streambanks, and increased erosion due to reduced ground cover are some of the effects common to cultural resources from grazing. These effects may impact recorded sites and sites which have not yet been discovered and recorded. These effects will be discussed in the following section.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

Adverse effects to cultural resources can be expected from grazing livestock on the landscape under this alternative. Trampling, artifact breakage, soil compaction, destabilization of streambanks, and increased erosion due to reduced ground cover are some of the effects common to cultural resources from grazing. These effects may impact recorded sites and sites that have not yet been discovered and recorded. The following is a summary of the potential impacts on cultural resources under Alternative 1.

Trampling

While moving about the range in search of forage, livestock trample on exposed surface archaeological material. Trampling results in several kinds of adverse effects to archaeological materials. Archaeological remains depend, in some degree, upon depositional context for their significance. Experiment evidence (US Army Corps of Engineers 1990) shows that livestock trampling displaces both horizontally across the ground surface and vertically in certain soil conditions (e.g., wet or damp soils adjacent to springs). In the latter instance, archaeological materials may come to occupy subsurface locations deeper or shallower than originally deposited. This kind of displacement makes interpreting the formation processes of the sites more difficult and sometimes impossible. If on a slope, cattle have the capability of moving the artifacts downhill by kicking clumps of dirt. They can move the artifact away from the site altogether by carrying artifacts within the mud on their hooves.

Artifact Breakage

Other experimental evidence (US Army Corps of Engineers 1990) indicates that one of the effects expected from livestock grazing is the breakage of artifacts exposed on the surface. This breakage may be in the form of edge damage to artifacts, which can make the interpretation of technological processes used in the manufacture of the artifacts difficult or impossible. Trained lithic analysts are often unable to determine if certain kinds of edge wear evident on artifacts are the result of prehistoric use, purposeful human modification during manufacture, or accidental flaking due to impact from livestock hooves, which weakens the scientific interpretation of artifacts.

Artifacts may also be broken in two or more pieces after being stepped on by livestock. This type of breakage separates portions of artifacts critical for age dating and morphological typing (e.g., projectile point bases) from the remainder of the artifact.

Soil Compaction

Soil compaction caused by livestock trampling can result in an adverse effect to subsurface archaeological remains, as well as contributing to exposure and accelerated erosion. In addition to the horizontal and vertical displacement of artifacts discussed above, this kind of disturbance can impair the stratigraphic interpretation of soils critical to understanding site formation, site function, and scientific importance. Soil compaction seems to be a greater concern in damp or wet areas than in dry soils (US Army Corps of Engineers 1990).

Reduced Ground Cover

Areas that are overgrazed to the point of removing or seriously depleting vegetation may increase the potential for sheet and gully erosion. Archaeological sites present in these areas are subject to damage from these erosional processes. This is most evident around springs, meadows, and other riparian areas where cattle tend to concentrate.

Destabilization of Streambanks

Riparian areas of streams tend to be high probability areas for the occurrence of archaeological sites. These sites often occupy terraces adjacent to the streambed. If livestock use results in shearing and collapsing of streambanks this would adversely impact archaeological sites present on the terrace. Cultural resources in these sites may become exposed and may be removed from the site by natural processes, livestock, or people.

Over 40 percent of the project area is capable of supporting livestock grazing and has been grazed for over the last 100 years. It is unlikely that any archaeological sites remain in the areas that have not been previously impacted by grazing. Archaeological sites with any remaining surface integrity could be expected only in remote areas and on terrain unsuitable to grazing. Therefore, archaeological sites with intact subsurface remains are important for their scientific information. These subsurface archaeological materials would not have been affected by grazing except in areas with specific types of soils or soil conditions. For example, archaeological sites located in wet or damp areas are likely to have been impacted adversely by livestock trampling (US Army Corps of Engineers 1990).

SUMMARY OF EFFECTS FOR ALTERNATIVE 1

Although it is unlikely that there are any archeological sites in capable rangelands have not already been impacted by grazing, the alternatives could still have effects on the sites. Alternative 1 has the highest allowable forage utilization under the proper use criteria and therefore has the greatest potential for adverse impacts on known and unknown historic and prehistoric resources. The higher level of forage utilization would mean that livestock could remain on the range for longer periods of time. This additional time on the range could lead to greater trampling, artifact breakage, soil compaction, and streambank destabilization as compared with the other alternatives. The higher level of forage utilization would also result in reduced ground cover as compared with the other alternatives, but there still should be adequate ground cover to protect archeological sites from erosional damage.

Cumulative Effects

Prehistoric and historic properties are non-renewable resources, consequently, any adverse effects are considered permanent. All effects are cumulative and diminish the overall resource of historic and prehistoric properties to one degree or another. When artifacts are damaged or improperly removed from their original context, they are permanently lost. Any action that

contributes to site deterioration or damage is an irreversible action. In this sense, all effects are cumulative and work to reduce the archaeological/historic record. Past grazing activities (including the building of structures to support grazing), mining activities, historic timber harvest, fire and fire suppression activities, road building, trails, and other construction and development have directly affected cultural resources by reducing the quality and/or quantity of sites due to disturbance or obliteration. In addition to the direct effects from past actions, indirect and cumulative effects may include increased site access and exposure to the elements, resulting in a greater chance of looting and artifact displacement from erosion. Soil compaction and artifact displacement can result from livestock congregation and trailing, as well as the use of motorized vehicles and camping in the areas of prehistoric sites. Historic sites have sometimes been scavenged for materials for use elsewhere. These same buildings and structures are particularly vulnerable to loss during wildfire.

An extensive list of past, present, and future projects and management actions has been included in Appendix E. On the Santa Rosa Ranger District, the management programs and events that have the greatest potential for cumulative impacts on cultural resources include livestock grazing, livestock water developments, and wildfires.

Livestock grazing occurs on over 90 percent of the District and is the most widespread management program. Past and current water developments have often been placed too closely to spring sites where cultural resources often occur. Spring protection fences have often been too small and/or are in disrepair resulting in livestock impacts in the spring area and on cultural sites. These water developments create livestock concentration areas that often result in considerable trampling, artifact breakage, and soil compaction.

In recent history, wildfires have burned over 25 percent of the Santa Rosa Ranger District. These fires have altered or destroyed numerous prehistoric and historic properties and have added to the reduction of ground cover.

Other programs and uses such as recreation, roads, and mining can have a detrimental cumulative effect on cultural sites. These impacts are limited however due to the limited nature of the uses.

ALTERNATIVE 2 – Proposed Action/Preferred Alternative

Direct and Indirect Effects

Under Alternative 2, there would still be potential adverse effects on cultural resources resulting from trampling, artifact breakage, reduction in ground cover, soil compaction, and destabilization of streambanks similar to those described for Alternative 1. The intensity and extent of potential impacts would likely be reduced. Under Alternative 2, forage utilization allowed under the proper use criteria would be reduced. This should result in improved vegetation conditions, reduced soil erosion, trampling and compaction, and improved streambank stability. These improvements would be most evident around springs, meadows and other riparian areas, which are also areas of high concentrations of cultural sites. With these improved conditions, cultural sites should be less exposed, which should reduce artifact breakage and improve concealment. Conditions under this alternative would make cultural sites less vulnerable to looting and illegal collection.

This alternative manages livestock grazing by the ecological condition of the rangelands, not by setting a particular stocking rate. The lower utilization rates that are part of this alternative should lead to lower impacts in areas that are grazed. Efforts to distribute grazing more widely to

utilize forage over a greater area could spread some of the impacts of grazing (trampling, artifact breakage, soil compaction) over a larger area than Alternative 1.

Cumulative Effects

Potential cumulative effects under Alternative 2 would be similar to those described for Alternative 1. Because this alternative is expected to improve resource conditions as described above that would result in reduced direct and indirect effects, it would therefore be expected that the overall intensity of cumulative impacts would also be reduced.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

Under Alternative 3, livestock grazing would be eliminated. This alternative would result in the least adverse impacts of the three alternatives on cultural resources. While no new impacts from trampling, artifact breakage and soil compaction would be occurring, the past impacts to cultural sites from these actions would continue into the future. Ground cover and streambanks would stabilize and recover over time. There would no longer be any adverse direct or indirect effects on cultural resources as a result of authorized livestock grazing within the project area. Unauthorized livestock from adjacent open allotments or private lands could result in adverse impacts on cultural resources.

This alternative may also result in increased grazing pressures on private or BLM administered lands. This increased grazing pressure could result in increased cumulative impacts on cultural resource sites on those lands. The potential for these impacts is of greatest concern on private lands which often contain large numbers of both prehistoric and historic sites due to their locations.

Cumulative Effects

The livestock grazing programs identified under Alternatives 1 and 2 would not continue within the project area. With the adverse impacts from authorized livestock grazing no longer occurring, there would be a reduction in the overall cumulative effects on cultural resources in the area.

There are some additional cumulative effects that could occur as a result of this alternative. Within portions of some allotments where cheatgrass is a concern, such as the Indian and West Side Flat Creek Allotments, there is potential for increased fire frequency. These wildfires could result in additional cumulative effects upon cultural resources.

DISPERSED RECREATION AND TRAILS

EXISTING CONDITION

The project area offers a variety of recreation experiences for visitors to the Forest. As discussed below, the primary recreation concerns related to domestic livestock grazing in the project area are dispersed recreation and trails.

Developed Recreation

Lye Creek Campground is the only developed campground in the project area. This campground has 13 campsites and is used mostly on weekends and during hunting season. The campground is fenced to exclude livestock. There is also a tract of three recreation residences located along Road Creek. These cabins are authorized under recreation residence special use permits.

Livestock grazing is not authorized within Lye Creek Campground, therefore developed recreation will not be analyzed in depth in this project.

Roadless Areas

The backdrop for the dispersed recreation experience is the roadless and wilderness areas of the District. On February 1, 1983, John B. Crowell, Jr., Assistant Secretary of Agriculture, announced that roadless areas previously studied for wilderness potential would be subject to reevaluation. The final rulemaking that determined roadless areas on National Forest System lands would be reevaluated became effective October 7, 1983. Five roadless areas were reevaluated in the Forest Plan (1986) as amended. Four of those roadless areas are included in this project area. None of these areas were recommended for wilderness designation at that time.

A map showing all roadless areas in the project area has been included in the project record. The Humboldt-Toiyabe National Forest is currently in the process of updating our land and resource management plans. In that planning process, a final recommendation will be made regarding those areas which have the characteristics and could be considered for wilderness designation.

None of the three alternatives presented under this analysis involve the construction or designation of roads. The District finalized a district-wide travel management planning process which identified all system roads that are open and limits off-road vehicle travel without a permit. The Travel Management Plan was signed on December 13, 2007. The Martin Basin Rangeland Project will not affect the roadless character of any roadless area on the District. Because this project does not involve the construction of roads, and will not affect the roadless character of any roadless area, roadless areas will not be analyzed in depth in this project.

Wilderness

On December 5, 1989, President George H. W. Bush signed the Nevada Wilderness Bill designating 14 new wilderness areas, one of which was the Santa Rosa –Paradise Peak Wilderness (Map 6). This wilderness encompasses approximately 31,000 acres, and includes a portion of the project area on the Buffalo, Rebel Creek, and Granite Peak Allotments. Direction in the legislation is as follows: “Where previously established, livestock grazing is permitted to continue in wilderness. Any adjustments in the numbers of livestock permitted to graze in wilderness would be made as a result of revisions in normal grazing and land management planning and policy setting process, not because of wilderness designation.” The potential effects of each alternative on the recreational and visual experience within the Santa Rosa-Paradise Peak Wilderness will be addressed within the Dispersed Recreation and Trails sections of this document. Other wilderness characteristics will not be analyzed in depth in this project.

Visual Quality Objectives

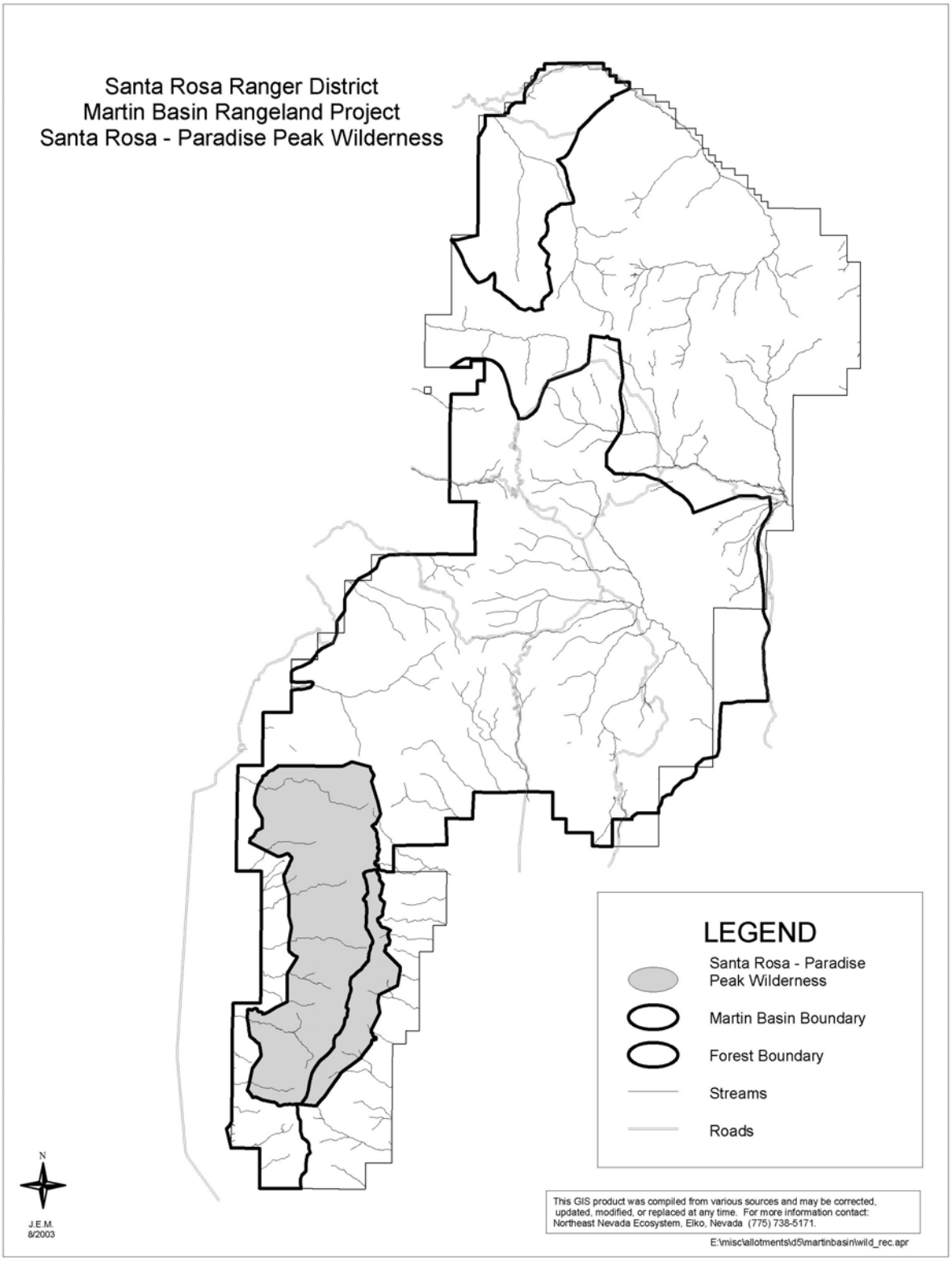
All lands within the project area have been inventoried and mapped using the National Forest-Visual Management System. The Santa Rosa-Paradise Peak Wilderness had been mapped as Preservation Visual Quality Objective (VQO) and includes portions of the Buffalo, Rebel Creek, and Granite Peak Allotments. This VQO allows ecological changes only and normally would preclude domestic livestock grazing. However, the Preservation VQO was only applied to this area because it was designated as wilderness. Accordingly, adjusting livestock management due to this VQO in this project area would contradict legislation that created the Santa Rosa-Paradise Peak Wilderness. Other areas are designated with Retention, Partial Retention, or Modification VQOs. These VQOs would prescribe management activities ranging from: “not visually evident”

to “management activities which may visually dominate the original characteristic landscape” (Map 7). Domestic livestock would be allowed under these VQOs.

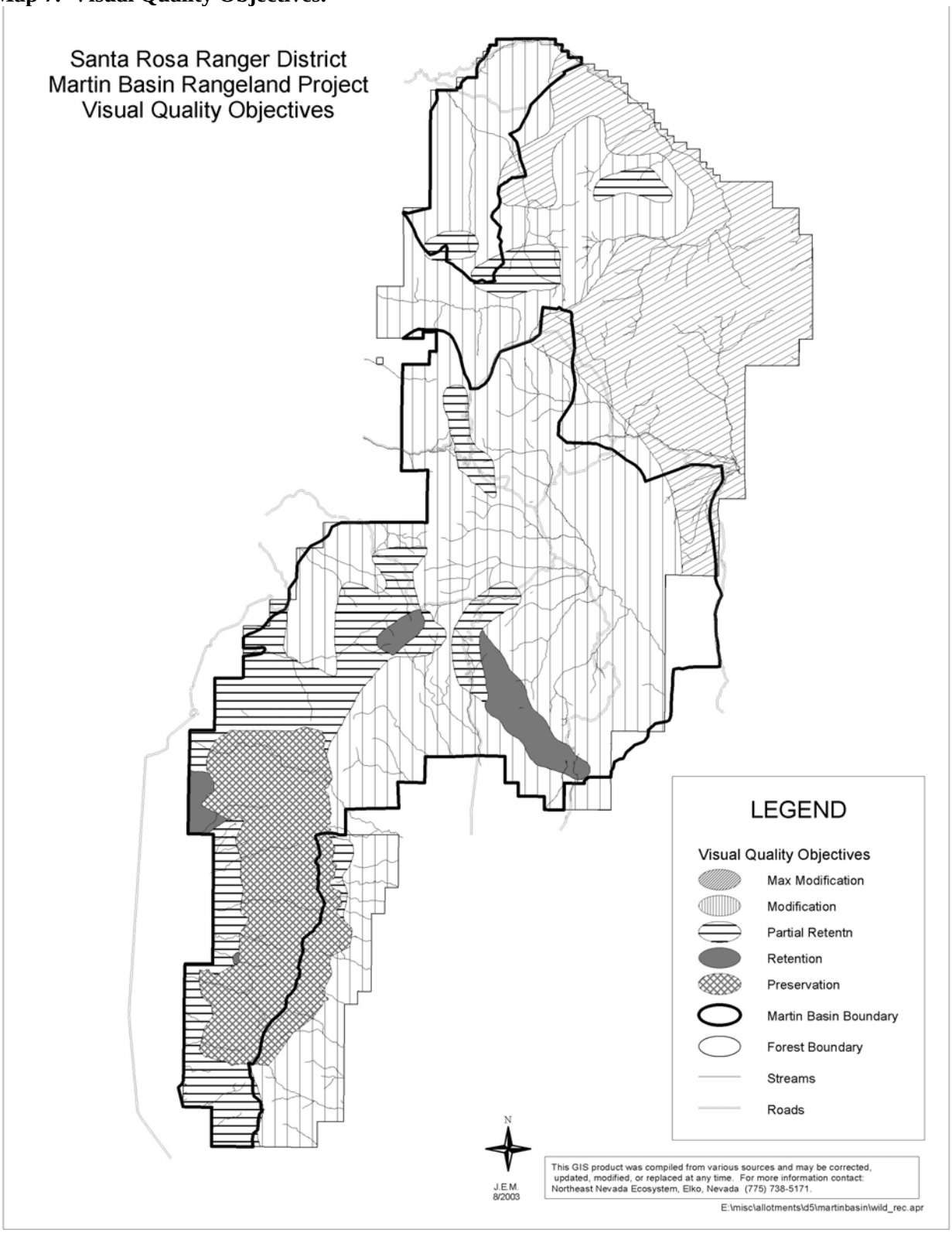
The Visual Management System is derived by combining the scenic value of natural landscape features and viewer sensitivity, or peoples’ concern for scenic quality. This landscape inventory and resulting management objectives are used in formulating Recreation Opportunity Spectrum (ROS) classifications (see Map 8).

The Humboldt National Forest Land and Resource Management Plan (Forest Plan) assigns ROS class goals to each management area on the Forest. The ROS system provides a way to help managers and recreation users understand what recreation experiences to expect on any specific area of the Forest. The system is applied in combination with other management direction from the Forest Plan to provide Forest managers with direction for managing recreation activities and settings on the Forest. As currently mapped District-wide, 85,144 acres are considered “semi-primitive motorized” and 158,654 “semi-primitive non-motorized,” for a total of 243,798 semi-primitive acres. Semi-primitive ROS areas are characterized by predominantly natural appearing landscape character with minimal rustic improvements provided for resource protection as opposed to visitor convenience. District-wide, 55,962 acres are considered “roaded natural” areas. Roaded natural areas are characterized by a predominantly natural appearing and developed natural appearing landscape character with roads and/or corridors of development such as campgrounds, trailheads, and recreation or administrative buildings. Current management and conditions of the project area are not preventing the achievement of this desired mix of ROS experiences except in concentrated use areas (CUAs).

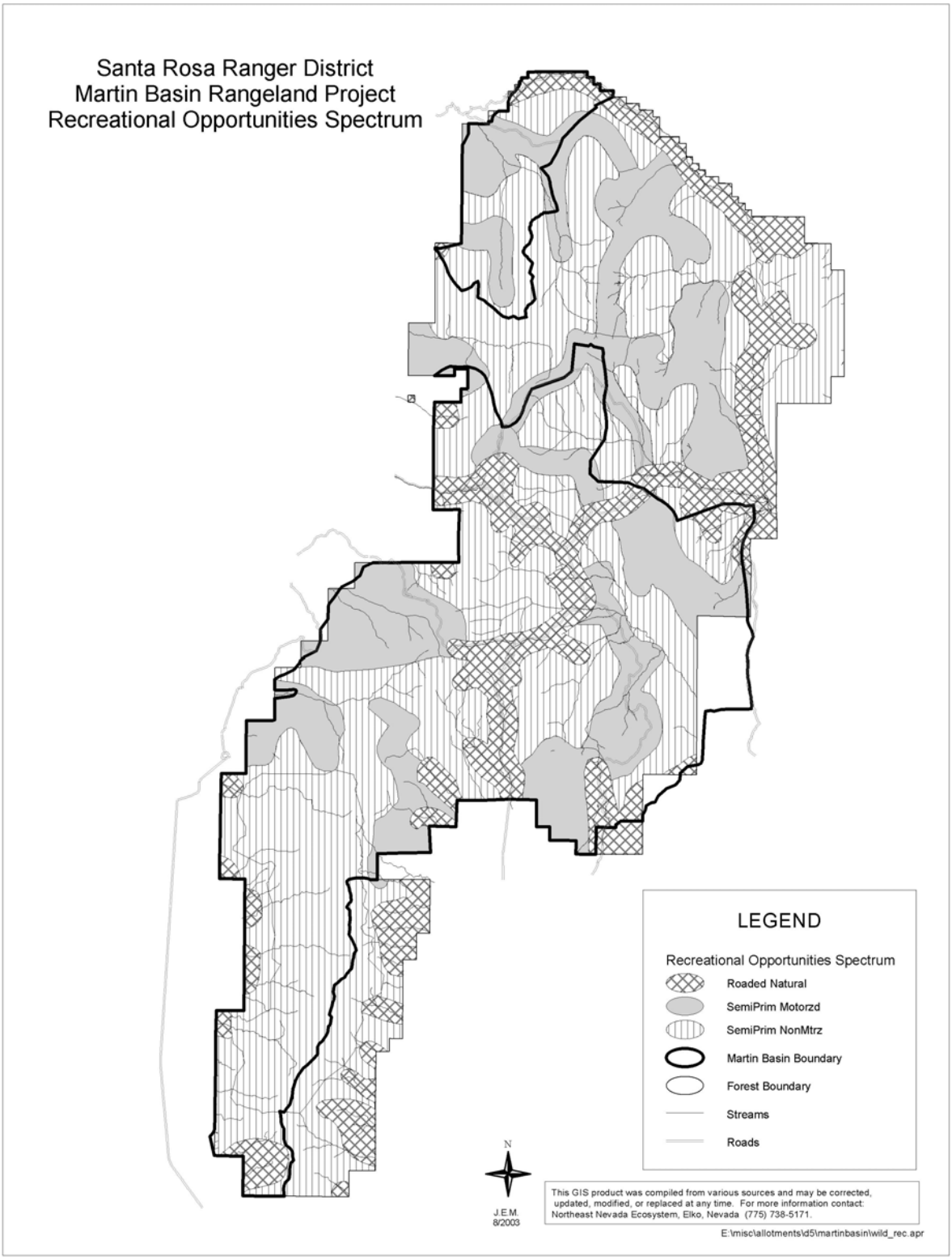
Map 6: Santa Rosa – Paradise Peak Wilderness.



Map 7. Visual Quality Objectives.



Map 8. Recreational Opportunities Spectrum.



Dispersed Recreation

Dispersed recreation activities are increasing annually. There is an estimated 6,000 visitor days per year of dispersed use on the Santa Rosa Ranger District. Most of this use occurs within the project area. Principal dispersed recreation activities are: sightseeing, bird watching, fishing, hunting, camping, picnicking, hiking, OHV use, mineral collecting, and snowmobiling.

The project area is popular for those participating in dispersed recreation activities. There are three concentrated use areas (CUA) identified within the project area which are:

- West-side wilderness access points.
- Indian Creek-Canyon Creek corridor.
- East Fork Quinn River.

A CUA is defined as an area containing at least three undeveloped sites where management time or dollars is expended because recreation use leaves evident impacts such as litter, vandalism, or soil compaction, or it is an assigned outfitter/guide camp. There are ten outfitter/guides that are permitted to operate in the project area. Visitors to these sites are often seeking more solitude and a more natural experience. Currently, there is no opportunity for road accessed dispersed camping in locations that are not grazed at least part of the high use season.

The Indian Creek-Canyon Creek road corridor lies in an area of natural beauty and is managed to preserve its scenic qualities. There are approximately 70 miles of fishable streams on the District. Big game hunting is a popular activity on the District. California bighorn sheep, mule deer, pronghorn antelope, and mountain lion are the huntable big game species. In addition to big game, chukar partridge, sage grouse, California quail, and morning dove are also hunted extensively. Hunting begins in late August and extends through January.

Dispersed recreation areas receive the most use on weekends and holidays, with riparian areas near water being the most popular. There are several popular sites along the Hinkey Summit - Canyon Creek Road (Forest Route 084) that passes through several of the allotments in the project area. Additional road accessed dispersed camping occurs on the low standard roads on the southern part of the project area in the Buffalo and Rebel Creek Allotments.

Most use occurs from early June through early October, which coincides with the grazing season. The highest use period is from mid June through Labor Day and then during mule deer rifle hunting season starting in early October. Hunting use is heavy along the road corridors with light to moderate use in some backcountry areas.

Trails

The Santa Rosa-Paradise Peak Wilderness supports the main recreation trail system for the District. Main access points to the trails found in the project area are at Andorno Creek, Buffalo Creek, Falls Canyon, Horse Canyon, McConnell Creek, Rebel Creek, and Big Cottonwood Creek. The Andorno Canyon Trail (3 miles) connects at the summit with the Buffalo Canyon Trail, which is a 4.5 mile climb through phyllite outcrops into the headwaters basin. The trail in Falls Canyon passes a small waterfall about 0.50 mile into the 1.5 mile trek. The trail in Horse Canyon (3 miles) and McConnell Creek Trail (2 miles) afford dramatic views of the valley below. The Rebel Creek Trail (4 miles) passes through large aspen groves with majestic views of Santa Rosa Peak to the south. At the crest of the ridge, it ties into the Cottonwood Creek Trail which continues for 3 miles on the Paradise Valley side of the mountain range. At high elevation, the

harsh, arid climate and granitic soils make portions of the trails susceptible to erosion. Many trail segments run through shale rock outcrops that are susceptible to sloughing.

ALTERNATIVE 1 – Current Management

Direct and Indirect Effects

There would be no change to the current dispersed recreation and trails experience of recreationists using the project area. Some recreationists feel that livestock and the impacts from grazing negatively impact their recreation experience. Complaints from these recreationists could be expected to continue or increase. Cattle would continue to be present in all CUAs within the project area for at least a portion of the recreation use season. Dispersed campsites would continue to be affected by cattle loafing and shading up in these areas. All trails within the project area would continue to be used by cattle. Cattle hooves damage trail surfaces and promote gullying along the trail. Cattle also affect the recreational experience the trails offer by leaving feces on the trail and consuming the vegetation along the trail. Existing impacts to trails would continue to occur with this alternative. Areas with a VQO of "Preservation" that are currently being impaired by grazing would likely continue to be affected. For visitors who think livestock enhance their experience, the opportunity to view livestock in rural and backcountry settings would be available at the current level.

The existing application of management standards that would not improve vegetative vigor and water quality to the degree needed to improve dispersed recreation experiences would continue. The activities that recreationists participate in, such as bird watching and fishing, would be less rewarding, as habitat conditions stay static or decline for these species.

Cumulative Effects

Wildfire and Prescribed Fire

Wildfires and prescribed fires such as the Buttermilk Prescribed Burn may disrupt recreation activities, cause smoke that obstructs views and visual experiences, or otherwise detract from recreational experiences on the District. These actions may also alter dispersed sites and negatively impact recreational experiences at these sites in the future. When combined with the direct and indirect impacts of cattle in dispersed campsites and on trails, wildland and prescribed fires could lead to a diminished recreational experience in the project area.

Mining and Mineral Exploration

Activities associated with gold and silver mining and exploration have occurred in the past and today contribute to many visitors' experiences related to the historical aspect of the activities. There are currently no active mines, and mineral exploration is limited to several areas near Buckskin Mountain. Roads and drill pads associated with these activities may negatively affect the visual quality of the natural setting observed by visitors to the District. When combined with the direct and indirect impacts of cattle in dispersed campsites and on trails, mining and mineral exploration could lead to a diminished recreational experience in the project area.

Recreational Activities

Conflicts between different recreation activities may also contribute to cumulative impacts to dispersed recreation, hiking, and wilderness experiences. The use of OHVs, hunting, or other activities may impact or negatively affect the experiences of other users on the District. Roads and trails may detract from a person's "wilderness" experience in more remote locations. When

combined with the direct and indirect impacts of cattle in dispersed campsites and on trails, other conflicting recreational activities could lead to a diminished recreational experience in the project area.

On December 13, 2007, the Santa Rosa Travel Management Project decision was signed. Under this project a system of motorized roads and trails was designated and off road travel was restricted. The designated system of roads and trails includes 310 miles of road and 17 miles of motorized trails. The only foreseeable road construction within the cumulative effects area would be temporary roads associated with mineral exploration activities. There are no additional plans for the construction of any roads or motorized trails at this time. Restriction of off-road travel will reduce conflicting recreation activities which should improve recreational experience in the project area.

Fuelwood Gathering

This activity is limited in scope and intensity; however, it may affect dispersed sites located within aspen stands or result in damage to trees adjacent to these sites. When combined with the direct and indirect impacts of cattle in dispersed campsites, fuelwood gathering could lead to a diminished recreational experience in the project area.

Livestock Allotment Developments

Current and potential future livestock allotment structures, such as fences and water developments, can detract from the visual aspects of a person's recreation and/or wilderness experiences. These developments may also be a barrier to recreation experiences. Gates along roadways and trails can at times be an annoyance or restrict access to individuals not accustomed to operating various styles of gates. When combined with the direct and indirect impacts of cattle in dispersed campsites and on trails, livestock allotment developments could lead to a diminished recreational experience in the project area.

ALTERNATIVE 2 – The Proposed Action/Preferred Alternative

Direct and Indirect Effects

The direct effects of grazing on recreationists would be reduced on allotments currently being grazed. Complaints from recreationists who believe the presence of livestock negatively affects their experience could be expected to decrease. Negative effects of cattle grazing on CUAs would be reduced due to a reduction in grazing pressure on allotments currently being grazed. The potential creation of riparian pastures, along with the removal of hot season grazing from riparian areas would improve the vegetative condition of dispersed recreation sites.

The application of proper use criteria that would improve vegetative vigor and water quality would indirectly result in improved dispersed recreation experiences on allotments currently being grazed. Effects to trails would be similar to Alternative 1.

The activities that recreationists participate in, such as bird watching and fishing, would be more rewarding as habitat conditions improve for these species on allotments currently being grazed.

Reestablishing grazing on the Bradshaw Allotment would adversely impact popular dispersed camp sites along Dutch John Creek by cattle loafing and shading up in these areas. Reestablishing grazing on the Rebel Creek Allotment would result in trampling damage to the trail tread on the recreation trail in Rebel Creek. Areas with a VQO of "Preservation" would be adversely affected by grazing.

Cumulative Effects

The reduction of impacts from grazing would improve the recreation experience, and could lead to increased recreation use, except on the Bradshaw and Rebel Creek Allotments where there would be an increase in impacts from grazing. Increased recreation use could lead to more impacts on trails and campsites. Additional management of recreation activities might become necessary.

The potential cumulative effects associated with this alternative would be similar to those described under Alternative 1.

ALTERNATIVE 3 – No Grazing/No Action

Direct and Indirect Effects

The direct effects of livestock grazing on recreation and scenic resources would be eliminated in the project area. Complaints from recreationists who think livestock negatively affect their experience would be expected to cease. Livestock impacts would be removed from three CUAs that are currently open to grazing.

Livestock impacts would be eliminated from 21 miles of the recreation trail system. This would eliminate any livestock-caused damage to trails. However, trails that were historically kept open by livestock would tend to become overgrown. Visitors who believe that viewing livestock enhances their recreation experience would have to seek the opportunity elsewhere.

The elimination of grazing would improve vegetative vigor and water quality. This would indirectly result in improved dispersed recreation conditions in the near term. The activities that recreationists participate in, such as bird watching and fishing would be more rewarding as habitat conditions improve for these species.

Visitors to the project area would have abundant opportunities to recreate without being affected by cattle. Conditions at dispersed campsites and on trails over a large area would improve, though effects to these locations from recreationists would continue. Restoration of impacted sites would more likely meet with success if the additional effects of livestock use were removed.

Cumulative Effects

Under this alternative, livestock grazing would no longer be authorized in the project area. Although grazing would no longer be occurring, there would continue to be effects of past grazing activities, which would diminish over time.

Also under this alternative, the increase in the levels of fine fuels could increase the potential for wildfire starts and increase sizes of fires. Increased fine fuels adjacent to dispersed campsites, roads and motorized trails, and in areas where firearms may be fired could lead to increased numbers of human caused fires.

OTHER REQUIRED DISCLOSURES

The National Environmental Protection Act (NEPA) at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with other environmental review laws and executive orders."

Short-term Uses and Long-term Productivity

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

Short-term uses are those uses that generally occur annually (i.e., grazing livestock). Long-term productivity refers to the ability of the land to produce a continuous supply of a resource. Grazing available forage under Alternative 2 (Proposed Action) is expected to improve the long-term productivity of soils, except in isolated areas around water developments and trails along fences.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

There is a potential for irreversible loss of cultural resources under either of the action alternatives. The Forest and the Nevada State Historic Preservation Officer (SHPO) have entered into a Memorandum of Understanding designed to minimize the potential loss of these resources as a result of grazing activities.

Energy Requirements and Conservation Potential

Grazing management requires very limited amounts of energy use for installation of improvements and the management and monitoring of livestock. Forest-wide energy requirements are not great. For the Martin Basin Rangeland Project allotments, expected energy requirements would be small. No conflicts with other jurisdictions are anticipated because of other proposed action or alternatives.

Possible Conflicts with Plans and Policies of Other Jurisdictions

No conflicts with other jurisdictions are anticipated because of the proposed action or alternatives.

Unavoidable Adverse Effects

Potential adverse impacts are identified in all the areas addressed in this analysis. However, most are minor and all could be mitigated through either the alternatives considered in the analysis or the cited design features.

Critical Elements of the Human Environment

Elements that are subject to requirements specified in statute, regulation or executive order that are addressed throughout Chapter 3 include cultural resources, water quality, American Indian religious concerns, threatened or endangered species, and wetlands/riparian zones.

Because no wetlands or floodplains would be altered, the goal and intent of Executive Order 11988 (Floodplain Management) and 11990 (Protection of Wetlands) would be met. Effects on the human environment are documented in Chapter 3 of this Draft Environmental Impact Statement (DEIS). The civil rights of any American citizens, including women and minorities, would not be differentially affected by implementation of any alternative.

Environmentally Preferred Alternative

Alternative 3 (No Grazing/No Action) is the environmentally preferred alternative. This alternative causes the least damage to the biological and physical environment and best protects, preserves, and enhances historic, cultural, and natural resources.

Preferred Alternative

Alternative 2 (The Proposed Action) is the Forest Service's preferred alternative. This alternative allows for continued livestock grazing under updated management direction that should maintain or lead to sustainable, functioning ecological conditions on our rangelands.

Environmental Justice (E.O. 12898)

During the course of this analysis, none of the alternatives considered resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristic.

Examination of community composition, as required under E.O. 12898, found no minority or low-income communities to be disproportionately affected under any of the alternatives. This was not raised as an issue during scoping.

National Forest Management Act

The Proposed Action is consistent with direction in the Humboldt National Forest Land and Resource Management Plan and the National Forest Management Act of 1976.