4.0 Current Condition

The purpose of this chapter is to present information on the indicators relevant to the issues and key questions developed in Chapter 2. The IDT (interdisciplinary team) was instructed to develop a reference condition or desired future, current condition and trend for each indicator.

4.1 Vegetation Dynamics

In this section the indicators developed to track the Vegetation Dynamics issue will be displayed by vegetation type. The use of vegetation types allows for an operational way to reference other documents such as the Revised Forest Plan and the Caribou National Forest Sub-Regional Assessment of Properly Functioning Condition (PFC).

Issue Indicators:
- **Structure**
- **Species Composition**
- **Disturbance Regimes**
- **Presence of Noxious Weeds**

The following pictures are a good comparison of the reference condition and current condition. Pictures were provided by Vic Bradfield, Range Specialist on the Soda Spring Ranger District.

Figure 4.1-1: Blackfoot Narrows Area 1912

Figure 4.1-2: Blackfoot Narrows Area 2004

Figure 4.1-3: Timber Creek 1915

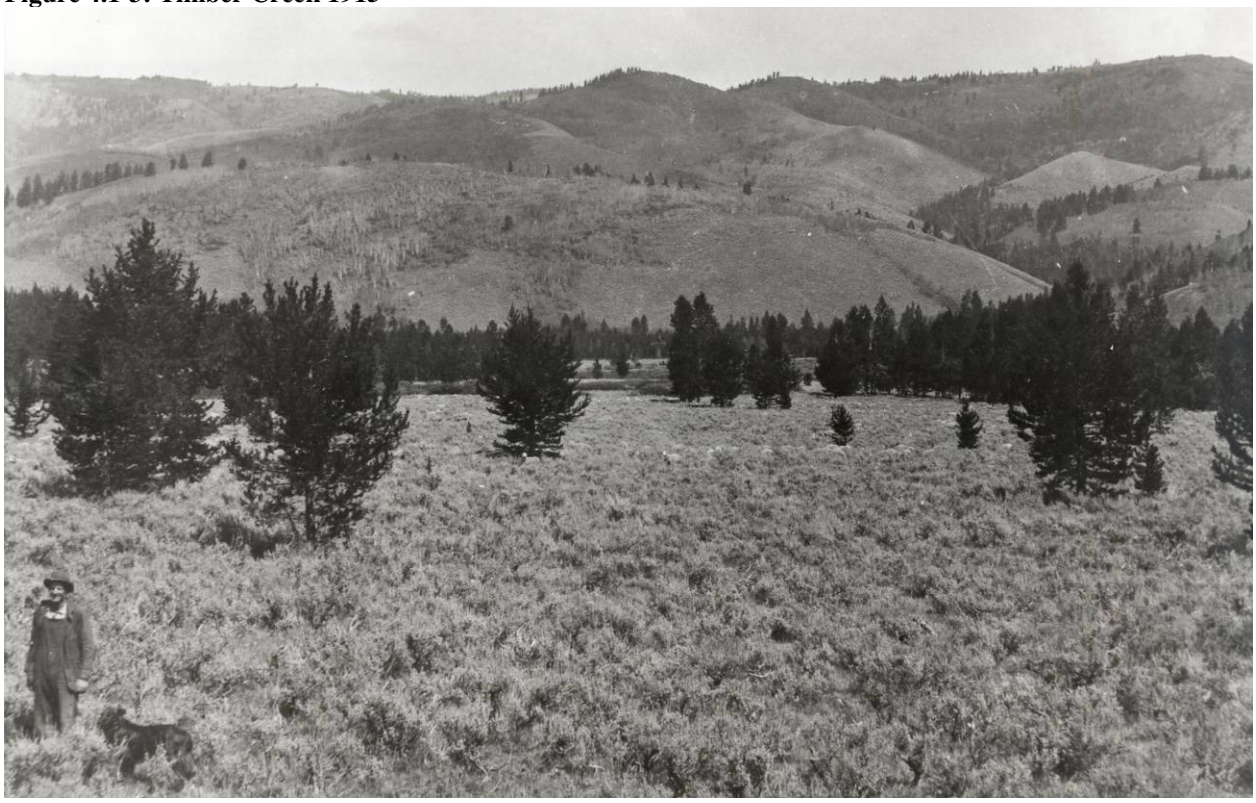


Figure 4.1-4: Timber Creek 2004

Figure 4.1-5: Upper Diamond Creek 1918

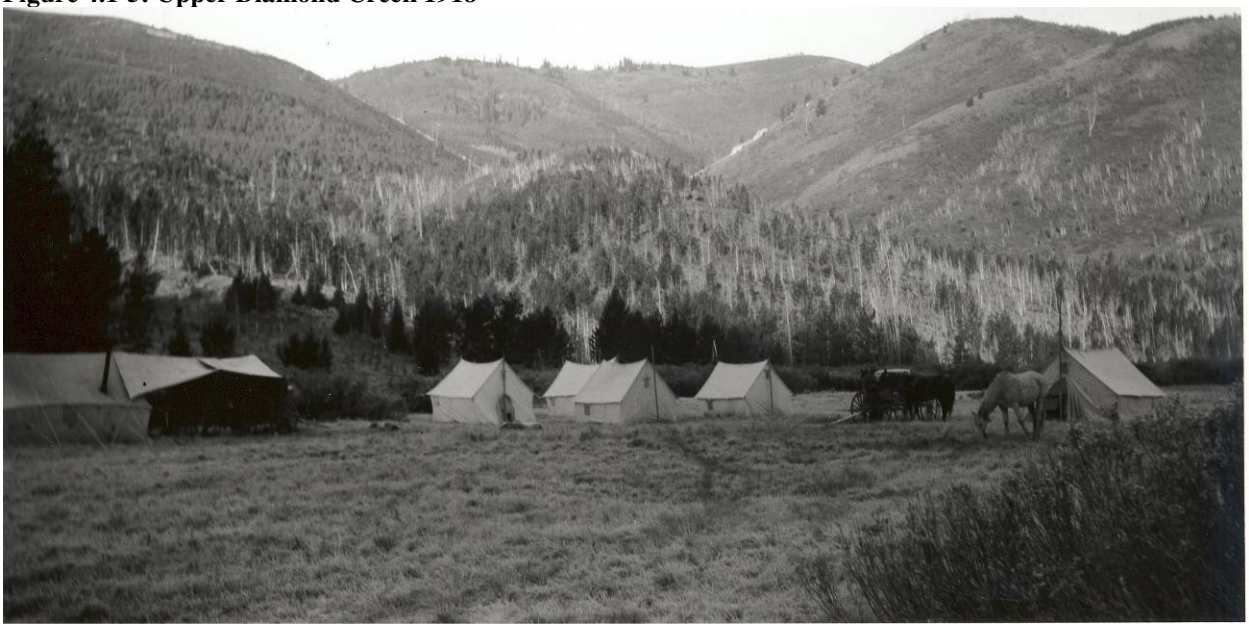


Figure 4.1-6: Upper Diamond Creek 2004

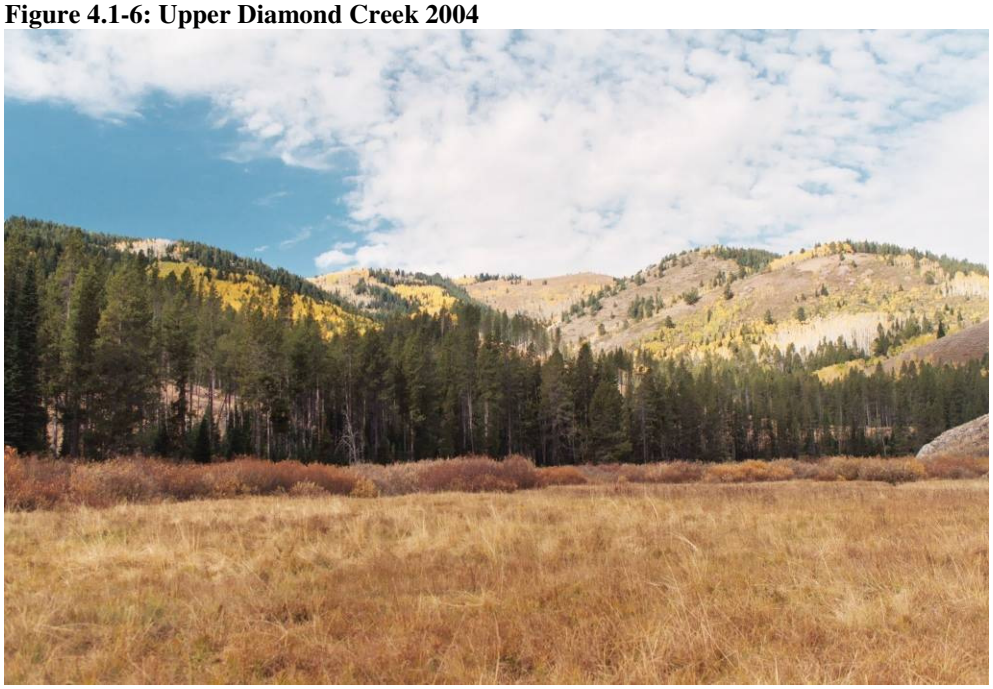


Figure 4.1-7: Dry Valley Date Unknown

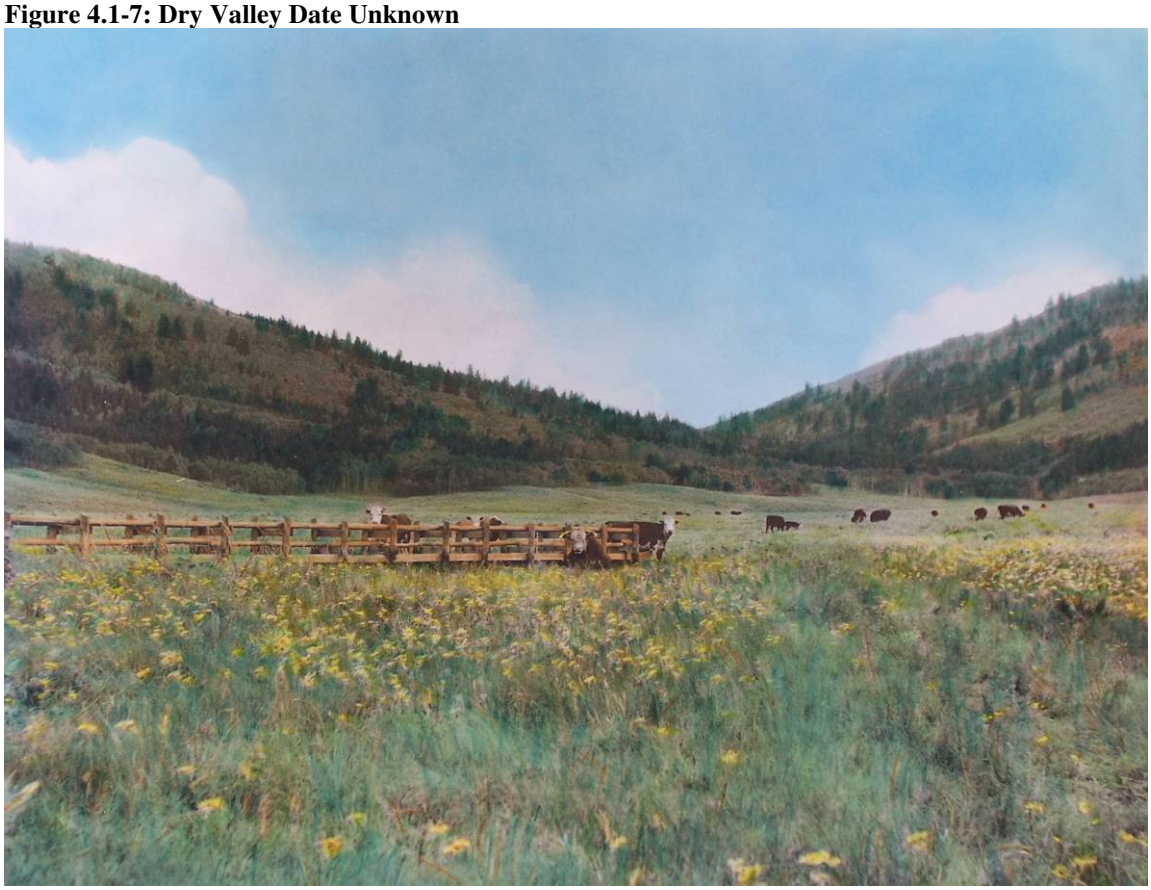


Figure 4.1-8: Dry Valley 2004

Figure 4.1-9: Johnson Creek 1910

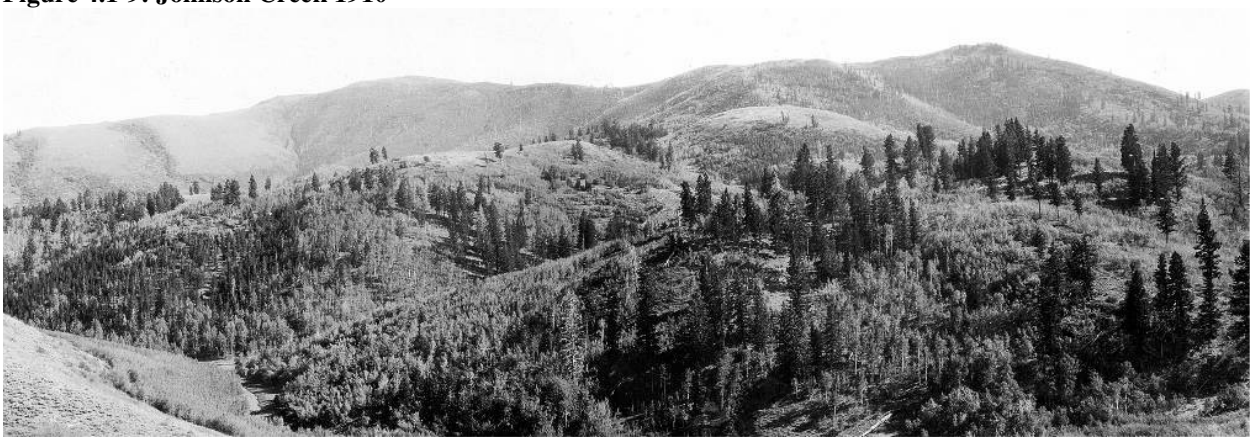


Figure 4.1-10: Johnson Creek 2004

Figure 4.1-11: Mabey Canyon 1911

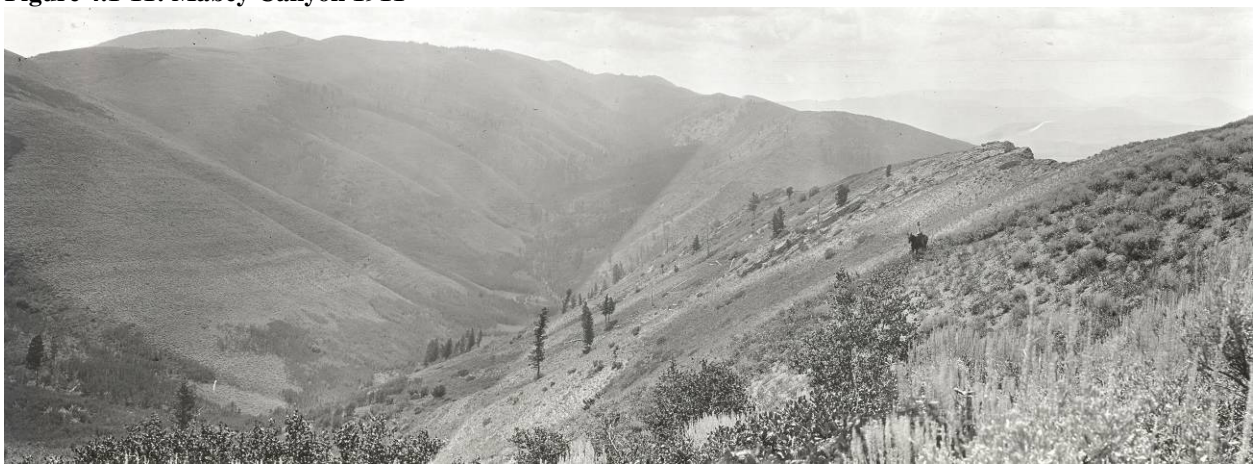


Figure 4.1-12: Mabey Canyon 2004

Figure 4.1-13: Slug Creek Cliffs 1911

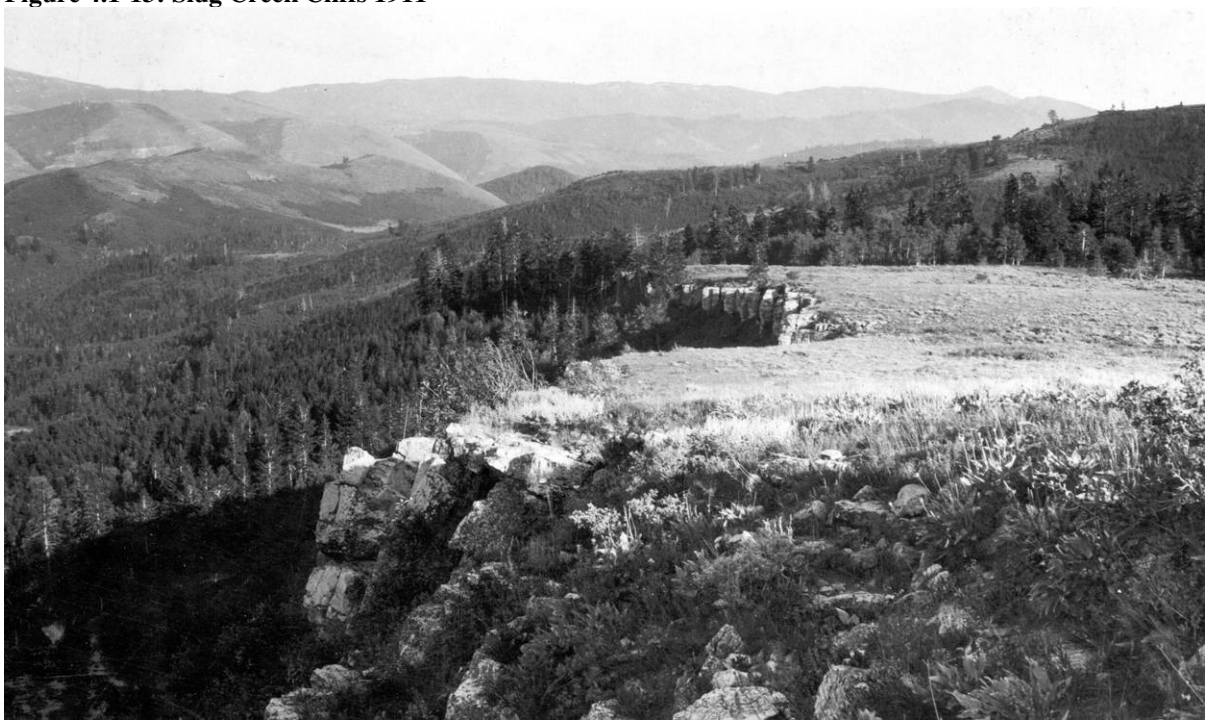


Figure 4.1-14: Slug Creek Cliffs 2004

Figure 4.1-15: Slug Creek Ranch 1910

Figure 4.1-16: Slug Creek Ranch 2004

Structure

Table 4.1-1 below compares the reference/desired condition and current condition for structure and Table 4.1-2 shows structural and cover type by subwatershed within the Upper Blackfoot Subwatershed.

Table 4.1-1: Reference/Desired Condition and Current Condition for Structure within UBW

Cover Type	Landscape Scale Reference/Desired Condition*		Current Condition
Douglas-fir	Grass/Seedling/Sap Young/Mid Mature/Old	10-30% 30-50% 30-50%	2% 0% 98%
Aspen	Grass/Seedling/Sap Young/Mid Mature/Old	20-40% 20-40% 20-40%	1% 0% 99%
Lodgepole	Grass/Seedling/Sap Young/Mid Mature/Old	10-30% 30-50% 30-50%	35% 7% 58%
Mixed Conifer	Grass/Seedling/Sap Young/Mid Mature/Old	0-10% 10-30% 30-40%	<1% 0% 100%
Sagebrush/ Grass	Balance range of structural stages • Early Seral • Mid Seral • Late Seral	 20-40% 20-40% 20-40%	 32% 52% 16%
Mountain Brush	Balance range of structural stages • Early Seral • Mid Seral • Late Seral	 20-40% 20-40% 20-40%	 20% 57% 23%

Table 4.1-2: Structural Percentages and Total Cover Type Acres per HUC 6th

HUC	Structure	Douglas-fir	Aspen	Lodgepole	Mixed Conifer	Mtn. Brush	Sagebrush
Angus Creek	ss	1%	2%	74%	<1%		
	ym	0%	0%	0%	0%		
	m	99%	98%	26%	100%		
	early					39%	36%
	mid					47%	54%
	late					14%	10%
	Acres	**1,802**	**1,708**	**1,437**	**1,354**	**615**	**4,862**
Diamond Creek	ss	<1%	1%	14%	<1%		
	ym	0%	0%	15%	0%		
	m	100%	99%	72%	100%		
	early					5%	30%
	mid					56%	45%
	late					39%	25%
	Acres	**6,805**	**3,489**	**3,634**	**2,184**	**131**	**4,586**
Diamond Creek Headwaters	ss	1%	1%	23%	<1%		
	ym	<1%	0%	10%	0%		
	m	99%	99%	67%	100%		
	early					3%	27%
	mid					41%	44%
	late					56%	30%
	Acres	**4,370**	**2,433**	**3,384**	**1,537**	**79**	**1,618**
Dry Valley Creek	ss	0%	<1%	0%	0%		
	ym	0%	0%	0%	0%		
	m	100%	100%	100%	100%		
	early					11%	27%
	mid					50%	64%
	late					39%	10%
	Acres	**642**	**2,933**	**73**	**811**	**208**	**2,170**
Goodheart Creek	ss	<1%	<1%	71%	0%		
	ym	0%	0%	0%	0%		
	m	100%	100%	29%	100%		
	early					0%	34%
	mid					0%	54%
	late					0%	11%
	Acres	**790**	**2,858**	**414**	**563**	**0**	**3,882**
Johnson Creek	ss	1%	<1%	42%	<1%		
	ym	0%	0%	6%	0%		
	m	99%	100%	52%	100%		
	early					7%	32%
	mid					66%	49%
	late					26%	19%
	Acres	**2,550**	**3,196**	**1,453**	**1,069**	**113**	**3,431**

HUC	Structure	Douglas-fir	Aspen	Lodgepole	Mixed Conifer	Mtn. Brush	Sagebrush
Lower Lanes Creek	ss	8%	2%	44%	0%		
	ym	0%	0%	3%	0%		
	m	92%	98%	53%	100%		
	early					16%	28%
	mid					64%	54%
	late					20%	18%
	Acres	**3,994**	**2,069**	**4,844**	**2,781**	**506**	**1,993**
Slug Creek Headwaters	ss	>1%	1%	47%	<1%		
	ym	0%	0%	0%	0%		
	m	100%	99%	53%	100%		
	early					5%	26%
	mid					75%	50%
	late					20%	24%
	Acres	**2,836**	**3,625**	**1,241**	**967**	**197**	**2,678**
Trail Creek	ss	<1%	<1%	4%	<1%		
	ym	0%	0%	74%	0%		
	m	100%	100%	23%	100%		
	early					0%	21%
	mid					0%	63%
	late					0%	16%
	Acres	**549**	**513**	**64**	**152**	**0**	**487**
Upper Lanes Creek	ss	<1%	1%	26%	0%		
	ym	0%	0%	5%	0%		
	m	100%	99%	70%	100%		
	early					55%	24%
	mid					45%	66%
	late					0%	10%
	Acres	**2,228**	**2,128**	**1,297**	**808**	**18**	**504**
Upper Slug Creek	ss	0%	0%	16%	0%		
	ym	0%	0%	0%	0%		
	m	100%	100%	84%	100%		
	early					0%	39%
	mid					100%	50%
	late					0%	10%
	Acres	**1,704**	**1,941**	**315**	**1,007**	**1**	**3,937**
Wooley Valley	ss	0%	0%	0%	0%		
	ym	0%	0%	0%	0%		
	m	100%	100%	0%	100%		
	early					64%	42%
	mid					35%	55%
	late					1%	3%
	Acres	**9**	**3**	**0**	**5**	**7**	**598**
Acres Total		**28,279**	**26,896**	**18,156**	**13,238**	**1,875**	**30,746**

*** gss – Grass/Seedling/Sap, ym – Young/Mid, m – Mature/Old, early – Early Seral, mid – Mid Seral, and late – Late Seral**

Species Composition

Table 4.1-3 below describes the reference/desired condition and current condition for species composition. Estimates were used for the current condition for species composition. Data to support these estimates is not available at this time. The current condition represents the percent of acres which meets the reference/desired condition.

Table 4.1-3: Reference/Desired Condition and Current Condition for Composition within UBW

Cover Type	Landscape Scale Reference/Desired Condition*		Current Condition
Douglas-fir	Douglas-fir Spruce/Fir	65-100% Ave >75% 0-35% Ave. <25%	>74% No Data
Aspen	Aspen Conifer	70–100% Ave 85% 0-30% Ave. <15%	<85% No Data
Lodgepole	Lodgepole Other Conifer	70 –100% Ave. >80% 0-30% Ave. <20%	>80% No Data
Mixed Conifer	Subalpine fir Douglas-fir Lodgepole Aspen	30-100% Ave. >40% 0-50%* 0-50%* 0-50%*	~40% No Data No Data No Data
Sagebrush/Grass	Sagebrush dominants historical habitat acres on Sagebrush does not dominant historical acres on	95 to 100% 0-5%	~90% ~10%
Mountain Brush	Mosaic of brush and herbaceous understory components.		No Data

Disturbance Regimes

Table 4.1-4 below describes the reference/desired condition and current condition for disturbance regimes. The data within the data below is based on Barrett's fire regime report (1991), the Caribou National Forest and Surrounding Area Sub-Regional Assessment of Properly Functioning Condition (USDA 1996), and Soda Front Analysis.

Table 4.1-4: Reference/Desired Condition and Current Condition for Disturbance within UBW

Cover Type	Landscape Scale Reference/Desired Condition		Current Condition
Douglas-fir	Fire (G3/4) Frequency Regime	16-66 Ave 41 yrs Non-Lethal to Mixed	110 Years + Mixed to Lethal Timber Harvest 4% Past Large Fire 1%
	Insects Disease	Endemic Endemic	Endemic Endemic
Aspen	Fire (G4) Frequency Regime	16-97 Ave. 54 yrs Mixed to Lethal	90 Years + Mixed to Lethal
	Insects Disease	Endemic Endemic	Endemic Endemic
Lodgepole	Fire (G6/4) Frequency Regime	29-97 Ave. 54 yrs Mixed to Lethal	110 Years + Lethal Timber Harvest 31% Past Large Fire 6%
	Insects Disease	Endemic Endemic	Endemic Endemic
Mixed Conifer	Fire (G6/4) Frequency Regime	11-191 Ave 77 yrs Mixed to Lethal	104 Years + Mixed to Lethal
	Insects Disease	Endemic Endemic	Endemic Endemic
Sagebrush/ Grass	Fire Frequency Regime	25-76 years Lethal	Approximately 50yrs + Lethal Recent Prescribed Fire 1%
Mountain Brush	Fire Frequency Regime	25-76 years Mixed	Approximately 50yrs + Mixed Severity Past Large Fire 5%

Noxious Weeds

There are several species of noxious weeds within the Upper Blackfoot Watershed. These Species include:

- Canada thistle- This species is wide spread within the watershed.
- Musk thistle- This species is dispersed within the watershed.
- Scotch thistle - This weed is known to infest one area within the watershed.
- Dyers woad- Dyers woad is found in small patches and as individual plants within the watershed.
- Yellow toadflax- This species is found in numerous large patches in the canyon and valley bottoms, but small patches are frequently located on the mountain sides and at high elevations.
- Leafy Spurge- This plant has been found at three or four locations within the watershed.
- Spotted knapweed- This weed is not widely spread within the watershed, but it is quite thick in a few locations.
- Black henbane- Black henbane is found in disturbed areas within the area.
- Houndstongue- Houndstongue is found at scattered sites within the area.
- Whitetop- One small patch of whitetop has been found within the watershed.
- Perennial pepperweed- One small patch of this weed was found within the watershed, but is believed to have been eradicated.
- Dalmatian toadflax- One small patch of this weed was found within the watershed, but is believed to have been eradicated.

4.2 Hydrologic Processes and Water Quality

Introduction

Condition Indicators:
- **IWWI Watershed Rating**
- **PFC Assessment**
- **Pfankuch Channel Stability**
- **Hydrologic Disturbance**
- **Beneficial Use Support**

Indicators for current hydrologic and riparian conditions on Forest Service administered lands are shown in the box to the right. Inland Water West Initiative (IWWI) watershed ratings studies were completed in 2000 as reconnaissance (preliminary) assessments for overall watershed conditions for Intermountain and Northern Region Forests. PFC (Proper Functioning Condition) assessment is an interagency (FS-BLM) methodology to evaluate riparian conditions for perennial stream corridors and wetland areas. The Pfankuch method assesses perennial stream channel stability. Hydrologic Disturbance is a measure of the percent of vegetative disturbance by fire, management uses and facilities. Beneficial Use Support discloses state findings on adequacy of support for uses such as fish, wildlife, agriculture, etc. While most areas in the area were analyzed for the IWWI, no analysis was done for the Upper Blackfoot. Sources for data in this analysis include the South Soda Sheep CE, Aspen Range Timber EIS, Diamond Creek, Dry Valley and Rasmussen Valley Cattle EAs, North Rasmussen Ridge Mine EIS, Blackfoot River TMDL and CERCLA studies for mines.

Inland Water West Initiative Ratings

IWWI ratings are reconnaissance level (preliminary) assessments of stream and watershed health, risk and certain specific causes (USDA-FS, 2000). They are generally based on limited data or in some cases on preliminary professional judgment and observation only. IWWI was developed using HUC 6 drainages as the reporting units, and used an older set of HUC 6 unit boundaries. A table of boundary changes for the HUC-6s is in Chapter 1. These ratings were completed in 2000. Three of the available IWWI ratings are applicable to hydrology and riparian conditions for this analysis: 1) Watershed Geomorphic Integrity, 2) Watershed Water Quality Integrity, and 3) Watershed Vulnerability, with these ratings displayed in Table 4.2-1, Table 4.2-2, and Table 4.2-3 respectively. A combined rating of the three categories (Geomorphic Integrity, Water Quality Integrity, and Vulnerability) were used to set high, moderate, and low priority watershed rating as shown in Map 5 of Appendix A.

Watershed Geomorphic Integrity reflects current condition of soil-hydrologic function as a sponge-and-filter system to absorb and store water, and physical soil-stream resilience. Where uppermost soil organic soil layers of soil (primary benefit) or ground cover vegetation (secondary benefit), are reduced, water runs off more rapidly, which increases erosion and negatively affects the watershed in other ways as well. Water Quality Integrity reflects overall water quality in a subwatershed. It is derived from the damaged stream segments layer. Water quality impacts include bank damage, sediment loads, channel modification, flow disruption, thermal change, chemical contamination, and biological stress. Watershed vulnerability reflects inherent risks of conditions becoming degraded if certain sensitive lands in the watershed are disturbed.

Lower ratings signify better condition or lower risk. A rating of 1 indicates 100% of stream segments (perennial and intermittent reaches) and/or watershed area is in dynamic equilibrium, properly functioning condition, or has soil-hydrologic function (soil-hydrologic sponge) in excellent or good condition relative to natural potential condition. A rating of 2 indicates an intermediate state, with up to 20% of stream segments or watershed area damaged, with recovery possible through natural means fostered by changes in management with no more than a minimum of capital investment. A rating of 3 indicates damage is widespread (e.g. more than 20%) to streams and watershed area is damaged and that outlay of capital investment and revised management is required, and that management changes must complement other recovery efforts. Where percent certainty of the rating is less than 90% in the rating, two values are given (e.g. 2-3) and the percent certainty relates to the primary (first) rating. The secondary rating is the second most likely condition or the way the watershed is "leaning," if the primary rating is correct. Where they are known, general sources of management causing change (impact) or risk of impacts is given, ranked in decreasing order of importance.

Table 4.2-1 IWWI Rating of Geomorphic Integrity

HUC-6	Primary Rating	Percent Certain	Secondary Rating	Sources of Change
170402071003	1	70-90	2	Grazing, Roads
170402071101	3	60-70	2	Mining, Roads, Grazing
170402071102	3	70-90	2	Mining, Roads, Grazing
170402071103	2	70-90	1	Mining, Grazing
170402071104	2	70-90	1	Grazing, Fire
170402071105	1	60-70	2	Grazing
170402071106	3	70-90	2	Roads, Flood, Grazing
170402071107	2	70-90	1	Roads, Timber, Grazing
170402071201	1	70-90		Grazing, Roads
170402071202	2	>90		Grazing, Roads
170402071203	2	70-90	3	Grazing, Roads, Timber
170402071302	2	60-70	3	Roads, Grazing
170402071303	2	70-90	3	Grazing, Mining, Roads
170402071304	2	70-90	3	Roads, Grazing

1= 100% good, 2 = 0-20% damaged, 3 = >20% damaged

Table 4.2-2: IWWI Rating of Watershed Water Quality

HUC-6	Primary Rating	Percent Certain	Secondary Rating	Sources of Change
170402071003	1	70-90	2	
170402071302	2	60-70	3	Bank Damage, Excess Sediment
170402071304	2	70-90	3	Bank Damage, Excess Sediment
170402071303	3	70-90	2	Bank Damage, Chemical Contaminants, Excess Sediment
170402071102	3	70-90	2	Chemical Contamination, Channel Modification, Bank Damage
170402071203	2	>90		Bank Damage, Excess Sediment
170402071202	2	>90		Bank Damage, Excess Sediment
170402071201	1	60-70	2	Bank Damage, Excess Sediment
170402071104	1	70-90	2	
170402071105	1	70-90	2	

HUC-6	Primary Rating	Percent Certain	Secondary Rating	Sources of Change
170402071103	2	70-90	1	Excess Sediment, Bank Damage
170402071107	2	>90		Bank Damage, Excess Sediment
170402071106	2	60-70	3	Excess Sediment, Bank Damage
170402071101	2	70-90	3	Bank Damage, Excess Sediment, Thermal Change

1= 100% stream segments good, 2 = 0-20% damaged, 3 = >20% damaged

Table 4.2-3: IWWI Rating of Watershed Vulnerability

HUC-6	Primary Rating	Percent Certain	Secondary Rating	Potential Threats
170402071003	1	70-90	2	
170402071302	2	70-90	3	
170402071304	2	>90		Moderately erodible soils
170402071303	2	>90		
170402071102	2	>90		Moderately erodible soils in the watershed
170402071203	2	>90		Moderately erodible soils in the watershed
170402071202	2	>90		Moderately erodible soils in the watershed
170402071201	2	>90		
170402071104	2	>90		
170402071105	2	>90		
170402071103	2	70-90	3	Moderately erodible soils in the watershed
170402071107	2	>90		Moderately erodible soils in the watershed
170402071101	1	>90		

1= 100% good, 2 = 0-20% damaged, 3 = >20% damaged

PFC & Pfankuch Assessments

Proper Functioning Condition (PFC) assessment qualitatively evaluates selected hydrologic, geologic and vegetative aspects of riparian areas to determine function and risk of degradation from natural disturbance typified by a moderate sized (25 to 30 year return interval) flood. The protocol is mostly used for grazing management on the Forest. Rather than the usual division into the three basic categories (Pritchard, 1998), many Properly Functioning Condition (PFC) analyses use an expanded five rating classes, using subdivisions of Functioning at Risk developed by Robert L. "Lee" Leffert, Caribou Forest Hydrologist (1989-2005). PFC is the best rating, indicating that the stream has enough of its natural protecting attributes to withstand a 25-30 year flood without unraveling. However PFC does not mean pristine, nor is there a rating given for pristine (a.k.a. Potential Natural) condition. "Functional at Risk-High" indicates that the stream is nearly functioning properly, but that minor problems or risk factors are present that make the stream susceptible to further degradation. "Functional at Risk-Moderate" indicates that the stream is mid-scale; having substantial problems or risk factors for degradation, but is still providing a moderate level of functionality. "Functioning at Risk-Low" indicates a stream has a relatively low level of functionality and/or serious risk factors or problems that could easily cause degradation to a Non-functional state. "Non-functional" means that vegetation, landform, or energy dissipaters such as large woody debris are so compromised that little or no system protection or function is provided. They may also be at great risk of further losses that would negatively impact to stream reaches below. Table 4.2-4 lists PFC and Pfankuch ratings. Some stream assessments include an ocular estimation of Rosgen stream type (Rosgen, 1994). The Pfankuch channel stability protocol (Pfankuch, 1978), divides the channel into three portions:

Upper banks, lower banks, and channel bed or substrate. This facilitates a more structured determination of stream sensitivity, stability and potential responses based upon the stream's current condition. Pfankuch channel stability rating is broken down into four general groups: Excellent (<38), Good (39-76), Fair (77-114), and Poor (>115). However, Pfankuch does not adequately consider the role of riparian vegetation; hence PFC is used to fill the gap.

Table 4.2-4 Proper Functioning Condition Ratings

Stream – Reach	Rating	Trend	Pfankuch	Rosgen
Angus Cr	FAR-L	D		
Bacon Cr – FB to 1 mi upstream	FAR-H	U	77	
Browns Cyn – near Flat Valley Rd	PFC	N/A	N/A	
Browns Cyn – lhf tributary (greenline site)	FAR-H	U	79	G
Burchertt Cr	FAR-L	U	100	
Cabin Cr – lower	PFC	N/A		
Cabin Cr – upper	FAR-M	N	106	
Campbell – lower	FAR-H	N	109	
Campbell – Upper	PFC	N/A	82	
Cold Spring Cr	FAR-H	N	104	
Coyote – Upper	PFC	N/A	112	
Coyote – Lower	FAR-M	U		
Daves Cr – above FB	PFC	N/A	76	
Diamond Cr (see Diamond Cr study)				
Diamond Flat wetlands	FAR	U	N/A	
East Mill Cr	FAR	N	86	B4
Flat Valley Cr	FAR-H	U	69	E5
Goodheart Cr - lower	FAR	U		
Goodheart Cr - upper	FAR	N		
Johnson Cr – upper	FAR-M, NF	N		
Johnson Cr – lower	FAR-M	N		
Kendall Cr	FAR-H	U	77	B4
Lander Cr – NF	PFC	N/A	56	B3/B4
Lanes Cr - above Forest Boundary	FAR-M	U	87	C3/A3
Lonetree Cr	FAR			
Mosquito Cr (nr East Mill Cyn)	FAR-M	N	86	
Olsen Cr – ½ mi ab FB (lower)	PFC	N/A	91	
Olsen Cr – ½ mi ab FB to FSR191/244 (upr)	FAR-M	N	95	
Rasmussen Cr - lower	PFC	N/A		
Sheep Cr – lower	FAR-M	N	90	E4b
Sheep Cr (lhf tributary)	PFC	N/A	71	B4
Slug Cr ¼ mi ab cattle guard	PFC	N/A		
Slug Cr ¼ mi ab cattle guard to horseshoe spr	PFC	N/A	84	E5/G5
Stewart Cyn - upper	FAR-H	N		
Timothy Cr ¼ mi ab FB to confl in sec 17	PFC	N/A	69	
Timothy Cr ¼ mi ab FB (lower)	FAR-M	N	88	C4b
Timber Cr	FAR-H	N	91	
Trail Cr	FAR-H	D		
Wood Cyn	FAR-M	N		
Yellowjacket Cr	PFC	N/A		

PFC = Proper Functioning Condition; **FAR-H** = Functioning at Risk – High
FAR-M = Functioning at Risk – Moderate; **FAR-L** = Functioning at Risk – Low
NF = Non-Functioning; N/A = Not applicable; **U** = upward trend; **N** = No trend; **D** = Downward trend
lhf = left-hand fork **rhf** = right hand fork

Hydrologic Disturbance

Disturbance of forested vegetation beyond a threshold of change alters hydrologic response and behavior. Thirty percent disturbance of forest cover has been identified in many cases as a threshold of change for measurable increases in water yield in small forested basins (Rothacher, 1970), and is currently the guideline for the Caribou NF Revised Forest Plan (2003). GIS and other derived spatial data were used to calculate total acres of disturbance using conservative guidelines for duration of vegetative change as a first cut approach. Though effects of harvest diminish over time, regeneration harvests and fires in forested areas assumed a 30 year window (though in many cases much less time to recovery is needed). Intermediate or partial harvests were assumed to change hydrologic behavior and used 20 years though they frequently recover in less time and in many cases do not change the hydrology measurably. Fires in non forested vegetation are assumed to recover hydrologically in three years. Longer term disturbances include motorized routes and mined areas. Buffers for routes are 50 feet for state highways, 40 feet for other improved roads, 20 feet for primitive and closed roads and 4-6 feet for motorized trails. Table 4.2-5 summarizes known hydrologic disturbance by HUC-6, the last column gives the number of acres in each HUC that under default conditions could be disturbed and still meet the guideline.

Table 4.2-5: Acres of Hydrologic Disturbance by HUC-6

HUC-6	Percent USFS	Percent USFS Disturbance	Acres till 30% Disturbance
170402070101	38.2	5.6	1707.1
170402070102	60.3	16.2	2239.9
170402070103	100.0	6.3	3198.3
170402070104	83.6	3.4	5614.8
170402070201	100.0	8.6	2476.1
170402070202	88.44	9.9	2094.1
170402070203	60.82	7.3	2012.1
170402070204	82.76	7.3	2655.5
170402070205	66.44	22.4	962.4
170402070206	50.2	13.3	1271.2
170402070207	0.0	N/A	N/A
170402070208	6.5	9.1	139.7
170402070209	11.2	4.8	446.3
170402070210	0.0	N/A	N/A

Water Quality

The Idaho Department of Environmental Quality (IDEQ) has been annually sampling up to 21 surface water sites for chemical contaminants in the Upper Blackfoot since 2004. This information is used to continue assessment of water quality impacts from phosphate mining operations and aid in prioritizing and implementing remedial activities in affected water bodies. The constituent of greatest concern is selenium due to aquatic affects at levels encountered, but

sampling for cadmium, chromium, copper, lead, nickel, silver, vanadium and zinc is also done. Selenium is the only constituent found to be in exceedance of state standards. Sampling is done in May when concentrations generally peak. Selenium levels greater or equal to the chronic aquatic live (CCC) standard of 0.005 mg/L (milligrams per liter) for aquatic life have been measured in the Blackfoot River, Goodheart Cr, Spring Cr, State Land Cr, and East Mill Cr. The minimum detection level (the lowest level that will trigger instrument response) for selenium is 0.001 mg/L, but the practical quantitation level (lowest level for accurate measurement) is 0.005 mg/L. Selenium levels greater than the acute aquatic life (CMC) standard of 0.02 mg/L were measured in East Mill Cr and nearby Spring Cr which are just upstream of the Blackfoot Narrows. At these concentrations, mg/L are equivalent to parts per million. Sites in the Blackfoot River watershed had lower selenium concentrations during 2007 sampling than in 2006, presumably due to less than "normal" winter snowpack (IDEQ 2007). Sampling, physical parameters and flow are given in Table 4.2-6, Table 4.2-7, Table 4.2-8, and Table 4.2-9.

Table 4.2-6 Selenium Concentrations (mg/L) Measurements 2004 – 2007

Stream	2004	2005	2006	2007
Angus Cr – upper	0.004	0.039	0.016	0.004
Blackfoot @ Monsanto haul Rd	0.002	0.005	0.006	0.006
Blackfoot @ Slug Cr Rd	0.005	0.006	0.007	0.006
Blackfoot @ Trail Cr Rd	0.002	0.006	0.006	0.005
Blackfoot @ China Hat	0.002	0.005	0.006	0.005
Blackfoot above Narrows	0.002	0.006	0.005	0.006
Blackfoot @ upper bridge	0.003	0.006	0.005	0.005
E. Mill (lower)	0.265			
E. Mill (middle)	0.31	0.62	0.44	0.43
E. Mill (upper)	0.78			
Goodheart Cr below Champ Mine	0.002	0.038	0.006	
Lanes Creek above Diamond confl	<0.001	0.001	<0.001	<0.001
Rasmussen Cr	<0.001	0.005	0.007	0.001
Sheep Creek @ Lanes Creek Road	0.009	0.003		
Slug Cr @ S Trail and Slug Cr Rd	<0.001	<0.001	<0.001	
Spring Cr (north spring)	<0.001			
Spring Cr (south spring)	<0.001			
Spring Cr @ Blackfoot R	0.02	0.038	0.03	0.026
State Land Cr	0.003	0.032	0.011	
Trail Cr	<0.001	<0.001		
Wooley Valley Cr	0.008	0.002		

Multiply mg/L by 1000 to convert to ug/L (micrograms per liter or parts per billion)

Figure 4.2-1: Selenium concentrations at area-wide sample sites (2004-2007).

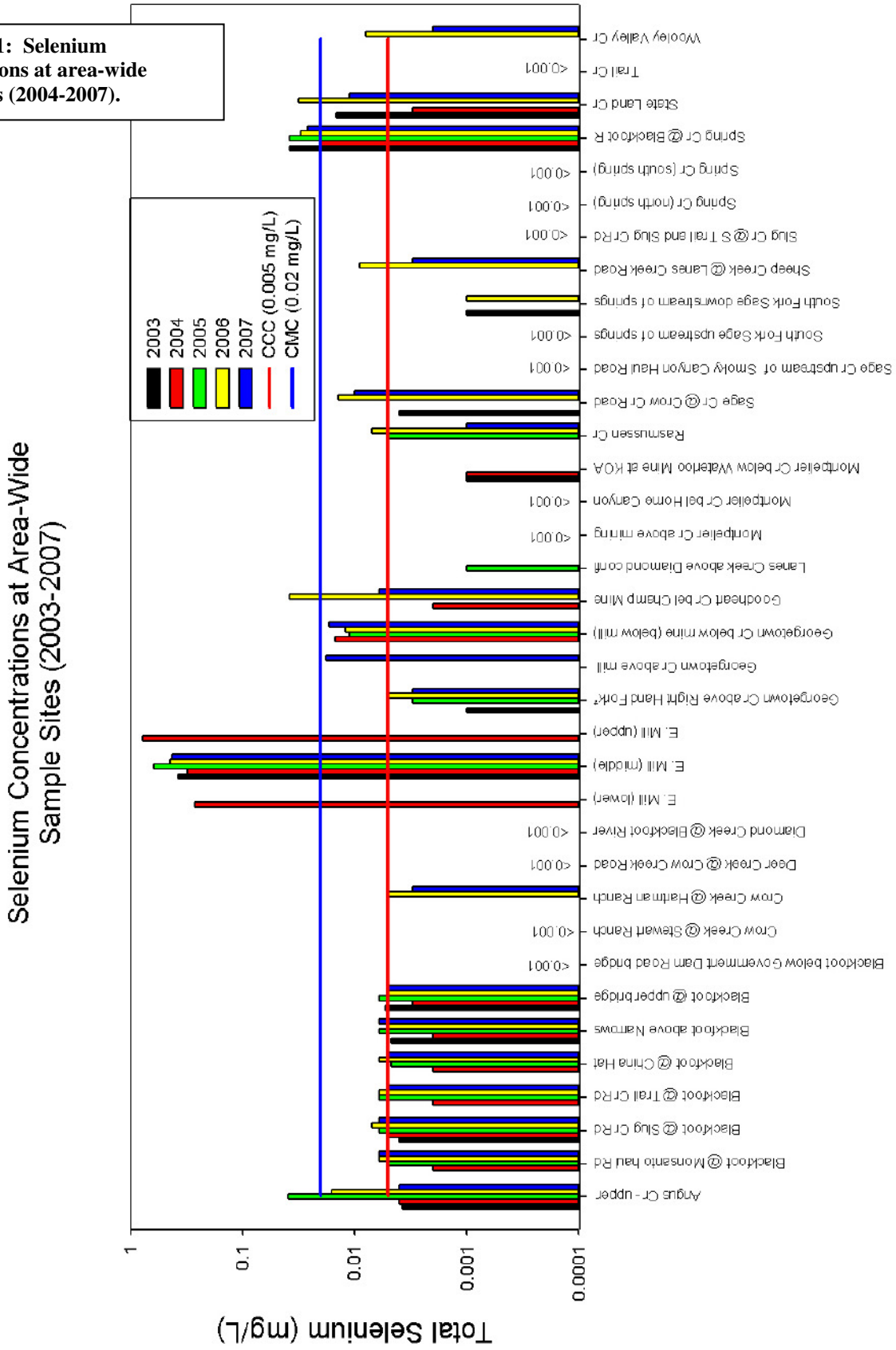


Table 4.2-7 Selected Physical Parameters in Streams in 2007

Stream	T (°C)	SpC (mhos)	DO %sat	DO mg/L	pH	Turbidity (NTU)
Angus Cr.	14.21	926	76.3	7.7	8.01	5.7
Blackfoot @ China Hat	10.31	401	82.4	9.3	7.83	11.8
Blackfoot @ Monsanto Haul Rd.	11.01	353	82.3	9.1	8.37	9.8
Blackfoot @ Slug Cr Rd	13.00	343	108.3	11.4	8.58	7.6
Blackfoot @ Trail Cr Rd	11.45	353	95.7	10.4	8.35	8.7
Blackfoot @ upper bridge	10.99	356	91.3	10.0	8.20	8.8
Blackfoot above Narrows	12.39	347	104.7	11.2	8.36	10.0
Diamond Creek @ Blackfoot R.	13.54	326	93.5	9.7	8.28	11.5
E. Mill (middle)	9.19	433	80.3	9.5	8.24	8.7
Goodheart Cr below Champ Mine	11.81	506	84.8	8.9	8.52	17.6
Lanes Creek above Diamond confl	13.59	359	93.0	9.7	8.31	7.8
Rasmussen Cr	11.58	358	90.9	10.2	8.28	9.2
Sheep Creek @ Lanes Creek Road	12.76	339	85.3	9.0	8.32	9.4
Slug Cr @ S Trail and Slug Cr Rd	10.63	429	101.3	11.2	7.95	3.2
Spring Cr @ Blackfoot R	14.38	361	96.7	9.9	8.35	5.8
State Land Cr	13.22	330	79.5	8.4	7.84	15.4
Trail Cr	15.17	409	108.5	10.9	8.33	1.5
Wooley Valley Cr	8.25	498	66.5	7.5	7.87	1.9

NTU = Nephelometric (dispersion) Turbidity Units **SpC** = Specific Conductivity
DO = Dissolved Oxygen. **%sat** = percent saturation; **mg/L** = milligrams per liter.

Table 4.2-8 Streamflow measurements - 2007

Stream	Date	Flow (cfs)	Date	Flow (cfs)	Mean (cfs)
Angus Cr - upper	5/08/07	0.25	5/11/07	0.18	0.2
Blackfoot @ Monsanto/China Hat	5/08/07	79	5/10/07	101	89*
Blackfoot @ Slug Cr Rd	5/07/07	116	5/10/07	118	117
Blackfoot @ Trail Cr Rd	5/07/07	119	5/10/07	105	112
Blackfoot above Narrows	5/07/07	123	5/10/07	114	119
Blackfoot @ upper bridge	5/08/07	104	5/11/07	82	93
Diamond Cr @ Blackfoot R.	5/08/07	19	5/11/07	17	18
East Mill Cr (middle)	5/08/07	1.9	5/11/07	1.8	1.8
Goodheart Cr - lower	5/07/07	0.49	5/10/07	0.31	0.4
Lanes Creek above Diamond Cr	5/08/07	57	5/11/07	42	50
Rasmussen Cr	5/07/07	0.94	5/10/08	0.62	0.8
Sheep Creek	5/08/07	5.2	5/11/07	5.9	5.5
Slug Cr @ S Trail & Slug Cr Rd	5/07/07	7.0	5/10/07	5.8	6.4
Spring Cr @ Blackfoot R	5/08/07	21	5/11/07	23	22
State Land Cr	5/07/07	0.32	5/10/07	0.28	0.3
Trail Cr	5/07/07	4.6	5/10/07	3.8	4.2
Wooley Valley Cr	5/07/07	0.08	5/10/07	0.10	0.1

* Mean includes third measurement of flow Blackfoot @ China Hat of 87cfs on 5/07/07.
cfs = cubic feet per second. **°C** = degrees Celsius.

Table 4.2-9 Physical Parameters and Flow in Streams for 9-13 May 2005

Stream	T (°C)	SpC (mhos)	DO mg/L	pH	Turbidity (NTU)	Mean flow (cfs)
Angus Cr.	8.5	681	8.7	7.7	1.5	1.0
Blackfoot @ Monsanto haul Rd	7.9	320	9.2	8.1	17.0	531
Blackfoot @ Slug Cr Rd	7.4	308	10.0	8.1	24.0	569*
Blackfoot @ Trail Cr Br.	7.9	315	9.4	8.1	26.1	693*
Blackfoot @ upper bridge	8.4	311	11.0	8.2	23.0	425
Blackfoot above Narrows	7.6	304	10.4	8.1	22.8	
Blackfoot @ China Hat	7.6	331	10.4	8.0	18.7	531
East Mill Cr - middle	6.7	469	11.0	8.2	25.7	3.7
Lanes Cr.	5.7	303	8.1	8.1	20.6	265
Rasmussen Cr.	11.6	283	9.4	8.1	9.1	4.9
Spring Cr @ Mouth	7.0	359	12.0	8.2	8.6	32

Turbidity = Nephelometric Units (NTU) * Flow values recognized as overestimates.

Provisional USGS data from Blackfoot River above Henry gage (USGS 13063000) indicate dissolved selenium concentrations (the USGS has determined that the dissolved component of selenium at this site accounts for more than 90% of total selenium, and other constituents need to be filtered, so all samples are filtered) varied considerably (Figure 4.2-1). Figure 4.2-1 compared to Figure 4.2-2 show that selenium concentrations correlate with increased discharges. The data also illustrate how dynamic selenium concentrations are in surface waters and how sample timing can influence results.

Figure 4.2-1: Selenium concentration at USGS gage 13063000, 2001-2007. 2007 data are provisional. (IDEQ, 2007)

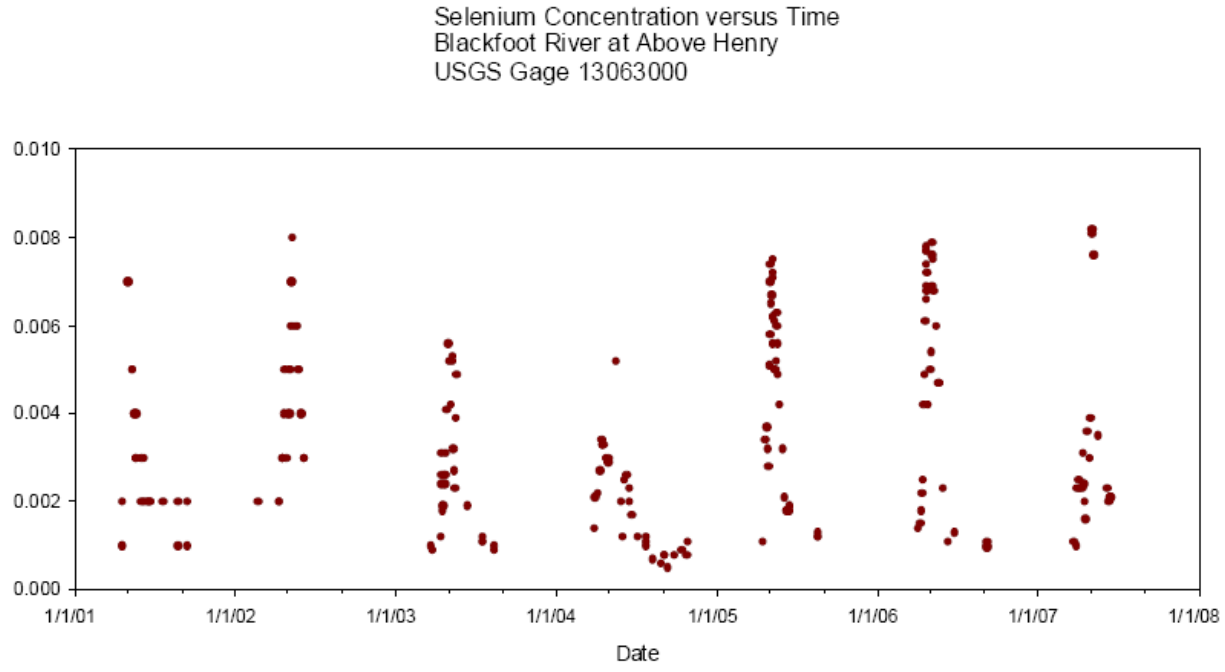
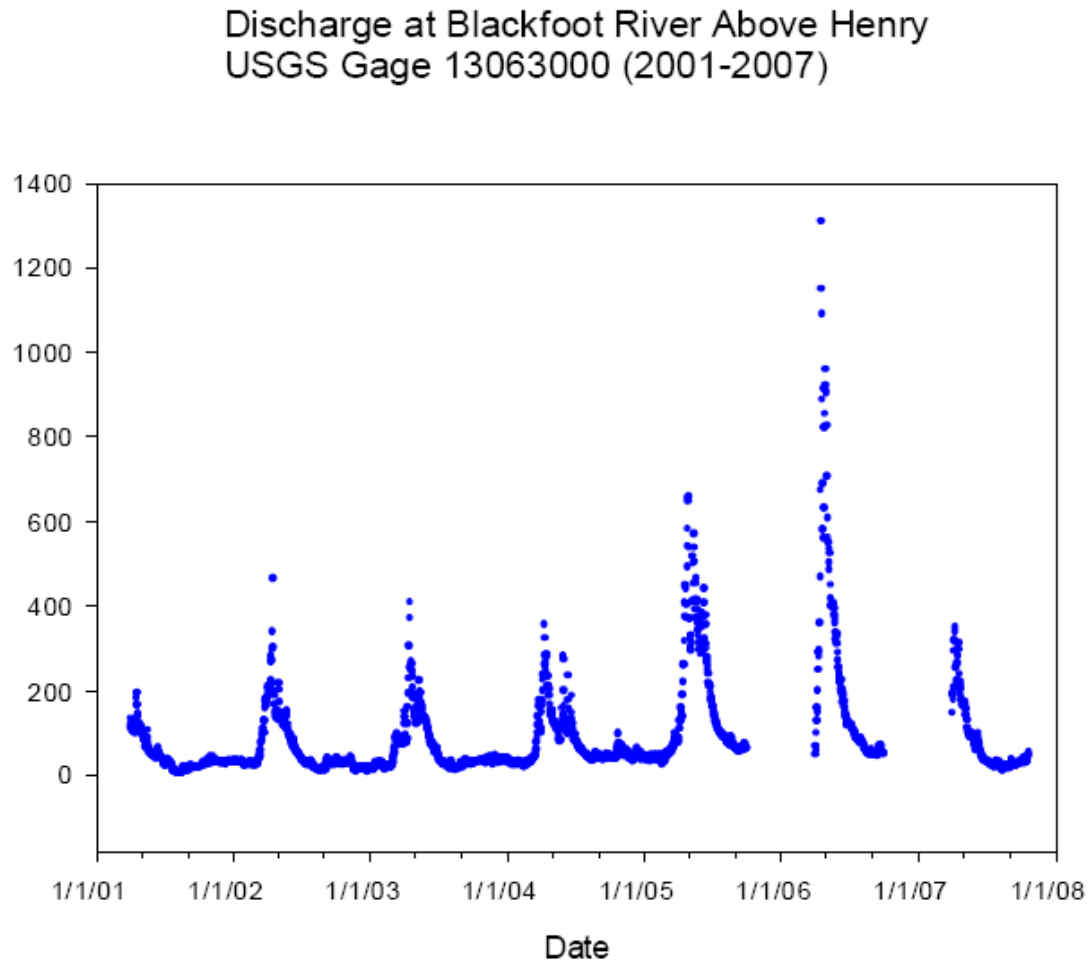


Figure 4.2-2: Blackfoot River flow, 2001-2006. 2007 data are provisional. (IDEQ, 2007)



Beneficial Use Support

As a part of the State's role in enforcement of the federal Clean Water Act, field crews for the Idaho Department of Environmental Quality survey conditions of area streams. Data and observations made in these surveys are then reviewed to determine the support of designated and existing biotic, recreational, economic, and aesthetic beneficial uses that should be maintained for waters of the state. Beneficial uses and support that have been identified by IDEQ in the analysis area are given in Table 4.2-10. The data presented comes from the latest official 303d/305b report, which was approved by EPA in December of 2005. DEQ, at least informally, generally considers streams of less then 1cfs baseflow as not supportive of a cold water fishery. Many tributaries are under this threshold. The Upper Blackfoot is part of the Blackfoot subbasin TMDL (IDEQ, 2001). An implementation plan to control pollutants was completed in 2001 and an addendum was added in 2002. The most frequently identified cause for impaired streams in the analysis area are sediment, habitat alteration, and chemical contamination.

At the time of this document IDEQ has a 2008 draft 303d/305b Integrated Report out for approval by EPA. The Draft Integrated Report and the Selenium Project Southeast Idaho Phosphate Mining Resource Area report (IDEQ 2007), as discussed in the water quality section above, indicates several streams within the Upper Blackfoot Watershed Analysis area are proposed to be listed for selenium. Angus and Goodheart below Champ Mine, exceeded the selenium CCC in two IDEQ samples over the past three years and has been included in IDEQ's Integrated Report as recommended for addition to the next 303(d) list. State Land Creek also exceeds the selenium CCC and was also recommended for 303(d) listing. Additionally, the mainstem Blackfoot River from Monsanto Bridge to its confluence with Blackfoot Reservoir exceeded the selenium CCC in 2005 and 2006 and was recommended for 303(d) listing. Sheep Creek, at Hartman Ranch and Wooley Valley Creek had concentrations of total selenium less than or equal to the CCC in 2007 (lower than concentrations in these streams in 2006) and therefore will not be listed unless further monitoring indicates exceedances (IDEQ 2007).

Table 4.2-10 Identified beneficial uses and support

Stream: (reach)	Assessment unit	CW	SS	PC	SC	DW	UB	Pollutant	ST
Angus Cr.	ID17040207SK023_04	NS	NA	NA	NA	NA	NA	S, O	
Angus Cr. (upper)	ID17040207SK023_02b	NS	NS		NA		NA	S, O	F
Angus Cr. (no-name)	ID17040207SK023_02						NA	NL	
Bacon Cr.	ID17040207SK019_02	NS					NA	S	
Bacon Cr.	ID17040207SK019_02b	NS	NA				NA	S, O	
Bacon Cr (upper)	ID17040207SK019_02a	NS	NA				NA	NL	
Bacon Cr.	ID17040207SK019_04	NS	NA				NA	S, O	
Blackfoot R. (bl Slug)	ID17040207SK010_05	NS	NA	NA		NA	NA	S	
Blackfoot R. (ab Slug)	ID17040207SK010_04	NS	NA	NA		NA	NA	M, Se, S	
Browns Cyn.	ID17040207SK020_02	FS	FS		NA		NA	NL	P
Cabin Cr.	ID17040207SK016_02a	FS	FS				NA	NL	
Campbell Cr.	ID17040207SK016_02g	FS	FS		NA		NA	NL	P
Corrailsen Cr.	ID17040207SK018_02d	FS	FS		NA		NA	NL	P
Coyote Cr.	ID17040207SK016_02b	FS	FS		NA		NA	NL	P
Daves Cr.	ID17040207SK018_02b	FS	FS		NA		NA	S	P
Diamond Cr.	ID17040207SK016_02						NA	NL	
Diamond Cr (lower)	ID17040207SK016_03	NS	NS				NA	S	X
Diamond Cr (middle)	ID17040207SK016_03a	FS	FS		NS		NA	B, S	
Diamond Cr. (upper)	ID17040207SK016_02e	NS					NA	S	
Dry Valley Cr.	ID17040207SK013_03	NS	NS		NA		NA	S, M, Se	
Dry Valley Cr.	ID17040207SK013_02	NS					NA	S	
Goodheart Cr.	ID17040207SK012_02b	NS	NS		FS		NA	S, O	F
Johnson Cr (upper)	ID17040207SK012_02a	NS					NA	NL	
Johnson (lower)	ID17040207SK012_03a	NS	NS		FS		NA	NL	
Kendall Cr.	ID17040207SK016_02h	FS			FS		NA	NL	
Kendall Cr. (lower)	ID17040207SK016_02i						NA	NL	
Lanes Cr.	ID17040207SK018_02	NS					NA	S	
Lanes Cr.	ID17040207SK018_02e	NS					NA	S, O	
Lanes Cr.6549	ID17040207SK018_04	NS	NS		NA		NA	S, O	F
Lanes Cr.	ID17040207SK018_03	NS					NA	S, O	
Maybe Cr.	ID17040207SK014_02	NS	NA		NS		NS	M, Se, M	
East Mill Cyn.	ID17040207SK015_02a	NS	NS		NA		NS	M, S, Se, O	P

Stream: (reach)	Assessment unit	CW	SS	PC	SC	DW	UB	Pollutant	ST
West Mill Cyn.	ID17040207SK010_02	FS	FS	NA	NA	NA	NA	NL	P
Olsen Cr. (lower)	ID17040207SK021_02b						NA	NL	
Olsen Cr. (upper)	ID17040207SK021_02a	FS	FS		NA		NA	NL	P
Rasmussen Cr.	ID17040207SK023_02a	NS	NS		FS		NA	S	F
Sheep Cr.	ID17040207SK022_02	FS					NA	S	
Sheep Cr. (lower)	ID17040207SK022_03	NS	NA		NA		NA	S, O	
Slug Cr.	ID17040207SK012_04	NS	NS		FS		NA	S, O	F
Slug Cr.	ID17040207SK012_03	NS	NS		FS		NA	S, O	F
Spring Cr.	ID17040207SK015_02	NS	NA						
Spring Cr. (lower)	ID17040207SK015_03	NS	NA		NA		NA	M, S	
Stewart Cr.	ID17040207SK016_02f	FS	FS		NA		NA	NL	P
Timber Cr.	ID17040207SK016_02d	FS	FS				NA	NL	
Timothy Cr. (lower)	ID17040207SK017_02b						NA		
Timothy Cr. (upper)	ID17040207SK017_02a	FS	FS				NA	NL	
Trail Cr.	ID17040207SK011_02	NA					NA	NL	
Trail Cr. (upper)	ID17040207SK011_03a	FS	FS				NA	S	P
Trail Cr	ID17040207SK011_03	NS					NA	S	
Chicken Cr.	ID17040207SK013_02a	NS					NS	M. Se	
Chippy Cr (lower)	ID17040207SK021_03	NS	NS		NA		NA	S, O	F
State Land Cr.	ID17040207SK010_02a	NS	NS		NA		NA	S, O	F
Unclassified	ID17040207SK000_05	NS		NA	NA		NA	S	

Key to Column Headings: CW = Cold Water Biota; SS = Salmonid Spawning; PC = Primary Contact Recreation; SC = Secondary Contact Recreation; DW = Domestic Water Supply;
UB = Other beneficial uses (Agriculture, Industry, Wildlife, Aesthetics), ST = Status
Key to Assessments: FS = Fully supporting; NS = Not supporting; NA = Not Assessed, P = Pass; F = Fail.
Key to Pollutants: S =Siltation; O = Other habitat alterations; M = Metals; Se = Selenium;
B = Bacteria: NL = None listed.

4.3 Soil Resources

Data Sources

- Soda/Montpelier Front Ecological Assessment for Vegetation and Hydrology (Caribou Targhee National Forest, 2002)
- A Hierarchical Stratification of Ecosystems of the Caribou National Forest, USDA Forest Service, Caribou National Forest. 1997.
- Soil Survey of the Caribou National Forest, Idaho 1990 (USDA Forest Service)
- GIS layers in the Caribou-Targhee National Forest GIS database
- Olson, *et al.* "Preliminary Landslide Study of Eastern Caribou Forest" 1970
- Watershed Management on Range and Forest Lands (Meeuwig *et al*, 1975)
- Stable states and thresholds of range condition on North American rangelands: A viewpoint (Laycock 1991)
- Range condition assessment and the concept of thresholds: A viewpoint (Friedel 1991)
- Sediment reduction through watershed rehabilitation (Noble 1963)
- Caribou National Forest Range Analysis Data (REA 1960-1980)
- Effects of trampling disturbance on watershed condition, runoff, and erosion (Packer, 1953)
- Changes in Soil Physical Properties under Grazed Pastures (Willatt *et al*, 1984)
- Blackfoot Rapid Watershed Assessment (USDA NRCS, 2007)
- Erosion tank data collected throughout Caribou National Forest (J. Lott)
- Aspen Range Soils Specialist Report (J. Lott)
- Monitoring Data for Greys Range Timber Sale J. Lott, 2006- 2007.
- Blackfoot River Subbasin TMDL Implementation Plan for the Caribou/Targhee National Forest (2002)
- 2004 TMDL Monitoring Portneuf River and Blackfoot River Subbasins. 2005. B. Higginson, Hydrologist, Caribou-Targhee National Forest.
- Grassland and Shrubland Monitoring Manual. (Herrick *et al*, 2005 p23).
- Plant Uptake of Selenium in Phosphatic Shale Deposits and Mine Waste Rock Dumps. 2003. C. L Mackowiak and M. C. Amacher.
- Maybe Canyon Site Investigation Caribou National Forest, Caribou Co, ID, TRC Environmental Corp, March 1999.
- Area Wide Investigation Southeast Idaho Phosphate Mining Resource Area Final Data Gap Technical Memorandum. Tetra Tech EM Inc. May 2001.
- Final Area Wide Human Health and Ecological Risk Assessment Selenium Project Southeast Idaho Phosphate Mining Resource Area. Tetra Tech prepared for IDEQ. December 2002.
- Final 2001 Spring Area Wide Investigation Data Transmittal. MWH. March 2002.
- Final 2001 Summer Area Wide Investigation Data Summary. MWH. July 2002.
- Plant Uptake of Selenium from Soils Overlying Un-mined Sedimentary Rock Units and Potential Use of These Soils as Capping Materials for Revegetated Waste Rock Dumps. 2005. Mackowiak, C L, and Michael C Amacher.

- Plant Uptake of Selenium from Waste Sedimentary Rock Units and Their Potential Use as Capping Materials for Revegetated Waste Rock Dumps. 2005. Mackowiak, C L, Michael C Amacher, and James R. Herring.
- Final Environmental Impact Statement for the Caribou National Forest Revised Forest Plan Volume I. 2003. USDA Forest Service.
- FSH 2509.18
- FSH 2209.21
- IFPA-Timber Sale BMP Reviews Summary 1990-2004 Caribou-Targhee NF, compiled by L. Leffert.
- Diamond Creek C&H BMP Review. 2006.
- Indicators of Rangeland Health and Functionality in the Intermountain West, June 2003. RMRS-GTR-104.
- Snake River Basin Idaho and Wyoming Cooperative Study, Upper Snake River Basin Erosion Report. 1979. USDA SCS.
- Area Wide Risk Management Plan. 2004. State of Idaho DEQ.
- Caribou National Forest Riparian Grazing Implementation Guide. 2005. R.L. Leffert, Forest Hydrologist, Caribou-Targhee National Forest
- Chemical Composition of Samples Collected from Waste Rock Dumps and Other Mining-Related Features at Selected Phosphate Mines in Southeastern Idaho, Western Wyoming, and Northern Utah. USGS Open-File Report 01-411. (Moyle and Causey, 2001).

Data Gaps

- No landslide inventory for the Caribou.
- Few local, long- term erosion studies of major Forest land uses (rangelands, forested lands, roaded and recreational areas)
- No inventory or plan for restoration of relic grazing disturbances, such as historic sheep driveways and bedding areas.

Assumptions

- Soil loss tolerances for soils in this watershed range from 1-5 tons per acre per year. This is the maximum annual erosion rate to maintain soil productivity, based on a variety of soil characteristics, e.g. depth to bedrock. The criteria can be found in the Region 4 Soil Interpretive Guide (1995).
- Models, such as the WEPP model, despite limitations, provide reasonable estimates of soil erosion rates for different land uses.

Erosion Processes

Current erosion rates in the Upper Blackfoot watershed are the cumulative result of natural background erosion plus additional amounts resulting from human disturbances. Some anthropogenic effects on erosion processes were discussed in the Rapid Watershed Assessment completed in 2007 by the NRCS. The focus of this document was primarily on private land, specifically wind and water erosion on privately owned pasture, dry cropland, surface-irrigated cropland, sprinkler-irrigated cropland, hayland and rangeland. They concluded that “sheet and rill ephemeral erosion is a moderate to severe problem” on some of the dryland farms in the basin,

measuring between 3-3.5 tons/acre/year of soil loss. The NRCS estimates wind erosion to result in more soil loss than water erosion on dry farmland, particularly after a low residue crop. They estimated that between 3-7.3 tons/acre/year of soil is lost, and attributed the variation to fluctuation in the tilled acres over time. To curb erosion rates and improve watershed conditions, the NRCS outlined land treatments on private farmland, implementing various farm programs and utilizing cost-sharing opportunities (NRCS, 2007).

Dominant land uses affecting erosion rates on National Forest System lands in the basin include the transportation system, domestic livestock grazing, mining, and recreation (TMDL, 2002). In the Blackfoot River Sub-basin TMDL Implementation Plan for the Caribou/Targhee National Forest (2002), the Idaho DEQ lists impaired segments of tributaries in the basin that flow, at least partially, through National Forest System lands. It also details the likely pollutant sources and possible corrective management actions.

Land use Affecting Erosion Processes: Domestic Grazing (Key Question #1)
One simple indicator of functioning upland rangeland is percent ground cover. Soils that have lost protective ground cover tend to erode more easily (Noble 1963). Other indicators include soil bulk density (an indicator of compaction), species richness, and channel stability (Herrick *et al*, 2005 p23).

Domestic grazing activities in several allotments in the Upper Blackfoot analysis area were assessed through an interdisciplinary NEPA process from 1995 through 2007. This process allowed for the update of AMPs, provided for adaptive management, and cumulated in the re-authorization of grazing activities by the District Ranger.

Literature related to rangeland condition thresholds and stable states of rangeland condition suggests that plant communities and conditions remain relatively unchanged for long periods (Laycock, 1991; Friedel, 1991). In the absence of major disturbances, such as fire or mechanical or chemical treatment, ground cover conditions have not changed in the last few decades. Noble (1963) studied the effects of ground cover on surface runoff and erosion. His results indicate that in the Intermountain West, a minimum of 60-70 percent ground cover is needed to effectively control surface runoff and erosion triggered by intense summer rainstorms. Reduction of cover and standing crop also exposes the soil more directly to the erosive force of wind (Thurow, 1991).

Three rangeland long-term erosion study sites are located in the Upper Blackfoot watershed. One site is sheep range in Slug Creek measuring erosion from a 62% slope with 80% ground cover. Average erosion rates (20 years of data collection) have been estimated at 0.14 tons/acre/year. The second site is rangeland along the Blackfoot Narrows. This site has a slope of 50% and ground cover of 75%. Average erosion is about 0.16 tons/acre/year. The study site was assessed in spring of 2006. Reduced ground cover and evidence of surface erosion was noted. A compaction measurement was taken, and results were 1.2 g/cm^3, which is well within healthy ranges (root limiting density for this site is 1.7 g/cm^3). The third site is cattle range located in Timber Creek on a sagebrush/Idaho fescue site with 77% ground cover on a 50% slope. Average soil loss from this site is 0.13 tons/acre/year. These range sites are steep, and the erosion rates are within the 1-5 ton/acre/year soil loss tolerance threshold for maintaining soil productivity for most soils in the watershed. These values corroborate estimates than most of the acres of rangeland

grazed by domestic livestock were losing about 0.1-0.5 tons/acre/year (Snake River Basin Study, 1979).

Range Analysis (REA, 1970-1982) was an effort in the 1960's and 1970's to collect data on rangeland production and ground cover for different habitat types in the grazing allotments. For the purposes of summarizing the data, these habitat types were generalized into the following vegetative cover types: sagebrush, aspen, conifer, riparian, tall forb, mountain brush, curlleaf mountain mahogany, and Bigtooth maple. The data was compiled for each vegetative cover type for the Soda Springs and Montpelier Ranger Districts. The result of this analysis is in **Table 4.3-1**.

Table 4.3-1: Average ground cover found by cover type on the Soda Springs and Montpelier Ranger Districts in the 1960's and 1970's (REA data).

Cover Type	Average Bare Soil (%)	Average Vegetation, litter, Rock (%)	Number of Observations	R4 FSH 2209.21 Ground cover for functionality (minimum %)
Sagebrush	28	72	434	70
Aspen	14	86	113	80
Conifer	11	89	446	---
Riparian	---	---	---	---
Tall forb	47	53	10	80
Mountain brush	25	75	340	70
Curlleaf Mnt. Mahogany	27	73	----	75
Bigtooth Maple	18	82	6	---

The Forest Service Rangeland Ecosystem Analysis and Management Handbook contains minimum percent ground cover for functionality for different vegetative cover types (FSH 2209.021 Chapter 20 revised 2005). Mountain Big Sagebrush ecological types should have at least 70% ground cover. Tall forb types should have a minimum of 80 percent ground cover. No ground cover requirements are mentioned for conifer types because they are generally above 90 percent due to needle litter in undisturbed conditions. The REA data collected on the districts indicates that most of the forested and rangeland sites are at or near properly functioning condition when comparing ground cover criteria.

The major exception is a few Tall forb sites, adversely affected by historic grazing practices, that are not meeting guidelines for minimum amounts of ground cover. This has been a concern for many decades, and numerous test plots and studies have been conducted to try to restore a more desirable vegetative community and improve ground cover. Repeat measurements have noted stable, or slightly improving, conditions on these sites; however, several sites, such as Diamond Flat, continue to be a concern. Additional work toward successful restoration is needed.

Figure 4.3-1: Treated *Wyethia amplexicaulis* (Nutt.) Nutt. (Mule-ears) in a degraded Tall forb site in Diamond Flat.

Figure 4.3-2: Degraded site in Diamond Flat supports early-seral *Wyethia amplexicaulis* (Nutt.) Nutt. (Mule-ears).

Figure 4.3-3: Ground cover and plant species composition study plot.

Figure 4.3-4: Nested Frequency study site in the Kendall allotment.

Plots have been established in most of the allotments in the watershed to monitor groundcover and species composition over time using the nested frequency methodology. Ground cover on several allotments was assessed from 2001-2006 (**Table 4.3-2**). Good plant species composition, soil condition, and ground cover were observed at most of the sample sites (see field data sheets), however, a few sites had lower than desired ground cover. Two data plots in the Lanes Creek allotment and one in the Yellowjacket allotment showed less than desired ground cover and unsatisfactory vegetation communities and soil conditions. The soil quality and the vegetative community have been degraded, which is likely a relic of historic livestock management and/or past non-structural improvement (e.g. Diamond Flat Sagebrush treatment). Monitoring of these sites indicates that most of the damage appears to be stable, but improving little under current management. This is expected, because previous soil loss negatively affected the long-term productivity of these sites, particularly livestock driveways and heavily used bedding grounds.

Table 4.3-2: Nested frequency vegetation plot data collected in 2005-2006.

Allotment	Date Collected	Vegetation Type	Sampling Method	Percent Soil Cover
Diamond/ Boulder	6/9/2006	Silver Sagebrush	100ft transect	79
Diamond/ Boulder	10/29/2003	Lodgepole pine/ Subalpine fir/ firebrush	ocular estimate	100
Henry/Olsen	7/14/2005	sagebrush/ snowberry	nested frequency	71
Johnson Creek	7/20/2005	upland mountain brush	nested frequency	89
Kendall Canyon	7/13/2005	sagebrush/ snowberry	nested frequency	90
Lanes Creek	10/3/2002	Mule-ears/ grass	ocular estimate	60-70
Lanes Creek	10/3/2001	sagebrush/ yarrow	ocular estimate	70-75
Lanes Creek*	7/12/2005	tarweed (monoculture)	nested frequency	48
North Sulphur	7/14/2005	upland mountain brush	nested frequency	96
Pole Canyon	7/13/2005	Tall forb	nested frequency	69
Slug Creek	7/12/2005	sagebrush/ snowberry	nested frequency	89
Yellowjacket	10/29/2003	snowberry/ mule-ears	ocular estimate	---
Yellowjacket	10/28/2003	Douglas fir/ snowberry	ocular estimate	80-85
Yellowjacket	10/29/2003	Douglas fir/ sagebrush/ snowberry	ocular estimate	85
* plot in a historic livestock bedding ground				

Detrimental soil disturbance was estimated at no more than 1.5% of any of the allotments. Disturbances include water troughs, fences, bed grounds, salting areas, handling facilities, loafing areas, roads, fires, timber harvest and mining disturbances. A few scattered areas of detrimental soil conditions were identified during field reconnaissance for the South Soda Re-authorization Decision Memo. These conditions were likely due to historic management, for example a few scattered areas of rill erosion and reduced ground cover along the historic Lander Cutoff Trail in the Diamond/Boulder allotment. These areas (less than 10 acres each) are of minor extent in the allotments. The annual operating instructions directed the permittee to not use the Lander Trail near Terrace Canyon. Detrimental soil disturbance on all allotments is well below the 15% Regional Guideline (FSH 2509.18 r4_2509.18-2002-1). The existing conditions of these allotments were determined to be meeting Caribou National Forest Revised Forest Plan (RFP) standards and guidelines and Regional soil quality guidelines (S. Soda DM, Soil Scientist Report, 2007, East Bridge FEIS 2004).

A grazing BMP field review was done in August of 2006 for the Diamond Creek Cattle and Horse allotment. It was noted that the riparian area along Diamond Creek was impacted by a combination of grazing and increasing dispersed recreation pressure. This indicated the need for adaptive management to avoid this conflict in the future. It was also noted that past restoration efforts on Diamond Creek were showing signs of improved ground cover and vegetation. Detrimental soil conditions were minor in extent and within guidelines (USDA Forest Service, 2006).

Riparian Soils

According to the 1996 Properly Functioning Condition Assessment of the Intermountain Region, negative effects on riparian areas include lowering of the water table, erosion in stream channels, exotic plant encroachment, and changes in vegetation. Studies indicate that animal use increases bulk density and decreases air permeability and hydraulic conductivity which can affect soil productivity (Willatt *et al*, 1984). It has been noted that on healthy range, the top layer of soil is usually the most permeable, the most fertile, and often the most resistant to detachment (Meewig *et al*, 1975). Excessive trampling by grazing animals causes an increase in runoff and erosion (Packer, 1953).

Overall, the grazing activities in the watershed have resulted in a few scattered areas of reduced ground cover, topsoil loss, and reduced diversity of desirable species. Some of these areas are relics of past over-grazing, and some are not. An inventory and restoration schedule would be useful for addressing these areas. It is recommended that periodic interdisciplinary grazing BMP reviews continue, as this process helps to evaluate compliance with BMPs and assess needs for adaptive management to meet resource objectives.

Land use Affecting Erosion Processes, Productive Landbase, and Soil Chemical Composition: Phosphate Mining (Key Question #2)

Phosphate mining is conducted in southeast Idaho using open pit methods. This activity results in major land disturbances. Overburden material is removed to access phosphate ore, leaving open pits and piles of waste rock. Some waste rock is used to backfill mined-out open pits. A general description of phosphate mining operations, reclamation and associated hazardous substances management can be found on page 3-128 of the FEIS for the Revised Caribou Forest Plan (2003). About 7600 acres within the Upper Blackfoot watershed (4,490 acres of National Forest System lands) have been disturbed by mining activities and associated roads and infrastructure to date (Mine Map 4 Appendix A). These acres are essentially removed from the productive land base until reclamation activities return productivity to the disturbed areas after mining is completed. Reclamation requirements and activities have evolved over the years, and the mines in the watershed have been reclaimed in a variety of ways with varied success.

Since the late 1990's, many sampling efforts have been made to characterize the levels of contaminants in the exposed mine waste rock, downstream riparian sediments, as well as undisturbed soils that developed in the Phosphoria deposits. Soil samples have been analyzed for a suite of chemical constituents, primarily metals. In the 2004 Final Area Wide Human Heath and Ecological Risk Assessment Report, Idaho State Department of Environmental Quality (DEQ) identified "contaminants of concern for future site-specific activities … as cadmium, chromium, copper, nickel, selenium, vanadium and zinc. Selenium and cadmium are considered to be the primary hazard drivers on a regional basis."

Phosphate mining activities have the potential to affect soil chemical composition. Lab data results for soil samples can be found in multiple studies. Undisturbed soils in the area typically contain less than 10 ppm (parts per million) total selenium (cited in Mackowiak and Amacher *et al*, 2005). The Maybe Canyon Site Investigation (TRC, 1999) includes results from 37 soil samples. Samples collected from undisturbed upland sites not affected by Maybe Creek had total Se ranging from 0.3 to 3.7 ppm, and undisturbed sites downstream of mine activities and within the floodplain of Maybe Creek had total Se values ranging from 0.4 to 27.8 ppm. Sediments in Maybe Creek downstream of mine activities were also tested, and found to have total Se values from 5.7 to 279.0 ppm. This report also contains metal characterization data for soil and sediment samples collected in 1998 (Appendixes O and P).

Figure 4.3-5: South Rasmussen ridge, reclaimed in 2001.

The Final Summer 2001 Area Wide Investigation (MWH) provides lab data on concentrations of metals in uplands and riparian areas near natural Phosphoria outcrops, as well as riparian areas downstream of mining activities and waste dump materials (Table 3-4 in DEQ 2002). Background samples (4 sample sites on Phosphoria outcrops near Conda Mine, Slug Valley, Stewart Creek drainage, and Diamond Creek drainage) had total Se values between 0.02 and 3.3 ppm, while waste dump materials (4 sites located at the Champ, Conda, Ballard, and Henry Mine dumps) contained between 5.0 and 36.0 ppm total Se. Impacted riparian zones were sampled (4 samples located at East Mill Creek, below Maybe Canyon Mine, Blackfoot River, above Wooley Range Ridge Creek, Angus Creek, below Angus Creek Res, and Pedro Creek) and had total Se ranging from 1 to 29 ppm. Riparian zone samples not impacted from mine drainage ranged from 0.4 to 2.3 ppm total Se. Surface samples from several mine waste dumps (Dry Valley, Gay, North Maybe, Champ, Mountain Fuel, Rasmussen Ridge, Wooley Valley, Conda, Lanes Creek, Ballard, and Enoch Valley Mines) were analyzed for a suite of heavy metals in the Final Spring 2001 Area Wide Investigation Data Transmittal. Total Se values ranged from 6.1 to 1500 ppm, and Cadmium values ranged from 5.8 to 120.0 ppm (from Table 3-3). Moyle and Causey took reconnaissance samples of waste dump surface materials and found from 1.3 to 285 ppm total Se (2001). In general, mine waste rock material and riparian areas that receive subsurface flow from mine runoff have the potential to be higher in total selenium, which is a contaminant of concern.

Mined areas within the assessment area reclaimed prior to 1995 include all or parts of Conda, Ballard, Enoch Valley, North and South Maybe Canyon, Champ, Mountain Fuel, Wooley Valley, Dry Valley, Lanes Creek, and South Rasmussen Ridge Mines, and were surfaced with the most readily available materials that would also function as revegetation growth media. These materials were primarily run-of-mine shale and other waste rock. After 2002, portions of the Dry Valley Mine and South Rasmussen Ridge Mine were reclaimed with topsoil that had been saved and then spread over the reclamation area. This practice of reclaiming with the native topsoil is likely to

improve the success by providing a growth medium with better productive potential and lower concentration of selenium and other contaminants of concern (Mackowiak and Amacher, 2003; TRC, 1999; DEQ, 2002). In 2003, the Forest Service adopted a threshold of 13 ppm total Se as guideline for mine reclamation soils and capping materials. Reclamation success is currently judged primarily on vegetation diversity, percent cover, and selenium levels of less than 5 ppm in above-ground plant biomass (see IDEQ, 2004; USDA Forest Service RFP, 2003; various Mine and Reclamation Plan approvals, post 2000). A study published in 2005 recommends testing the total selenium in disturbed soils and even native soils developed on the Phosphoria formation to avoid using soils with total Se values greater than 13 ppm (Mackowiak *et al*, 2005).

Mackowiak *et al* (2005) studied the potential of waste sedimentary rock units for use as capping materials. They found that dolostone and limestone occurring in the Phosphoria formation, with the exception of that in the Meade Peak member, had levels of selenium below 35 ppm and could safely be used as capping material. Rex chert with selenium levels below 5 ppm, with the exception of chert near the Meade Peak member, should also be acceptable capping material. In another study, undisturbed soils naturally occurring on the Phosphoria formation were assessed for their value as a surface material for mine reclamation (Mackowiak and Amacher, 2005). They found that disturbed soils with total selenium levels below 13 ppm should be acceptable surface material (Mackowiak and Amacher, 2003), and that soils testing above 50 ppm total Se should not be used to cap dumps. Of the 40 mine waste dump surface soil sample results reported in MWH Spring 2001 in the Blackfoot watershed, only 3 samples were below the level of 13 ppm total selenium. Since then, additional mine-specific sampling has been conducted, particularly data on the Conda Mine (Sampling data from the Preliminary Draft Conda Report 2007).

Land use Affecting Erosion Processes: Vegetation Management (Key Question #3)

In the last 44 years, about 10,900 acres (9% of the acres of National Forest System lands in the watershed) have been harvested in this basin. See the Vegetation section in Chapter 3 for past vegetation dynamics. Since the early-mid 1970's, site-specific analysis was completed prior to the timber harvest activities to determine if the soils were suited to the proposal, and later, as Forest Plans were written, if the proposed action met Forest Plan Standards and Guidelines.

Figure 4.3-6: Litter sample collected at the Greys Range timber sale.

Figure 4.3-7: Photo from BMP review of Upper Dry Canyon Unit 6; harvested in 2004 (Leffert, 2004).

Post-harvest monitoring has been completed to assess impacts to the soil resources, with intensive data collected this past summer in old harvest units proposed for re-entry in the Aspen Range Timber Sale (planned for 2008). This monitoring showed that timber harvest activities on 330 acres from 1984 to 1997 within the Aspen Range analysis area had resulted in the persistence of an estimated 23 acres of soil compaction. Harvest prescriptions sampled included tractor-logged clearcut and selection cut (Monitoring Data 2007). The 2007 Northern Region Soil Quality Monitoring Protocol was used (USDA FS 2007) which provides an unbiased sampling strategy with a confidence level for some attributes. Existing detrimental soil disturbance (80% confidence) ranged from 0 to 7 percent. This monitoring showed that past harvest had not negatively affected productivity and those old harvest units were well below the guideline threshold of 15% for detecting changes in soil productivity (as defined in FSH 2509.18). Three units of the Greys Range Timber Sale were also monitored for post-harvest impacts to soil resources. The results of this found a fair amount of soil displacement (field monitoring data 2006-2007). In one unit 14% disturbance was found, in another, skid trails and other displacement was estimated at 20-25% of the unit. These observations were made post-harvest, but before mitigation measures, such as ripping skid trails, were completed (Greys Range TS monitoring). Overall, there have been some detrimental disturbance, primarily rutting and compaction, associated with timber harvest in the watershed, but based on the data available and current thresholds, site productivity has been maintained.

Several BMP (Best Management Practice) reviews have been conducted in the watershed; units in 6 sales from 1991-2004. These reviews assessed BMP implementation and effectiveness in the Huckleberry Basin, Upper Fossil, Diamond Flat, Pole Canyon, Campbell, and Upper Dry Canyon Timber Sales, and found good implementation on all sales except Campbell and Upper Dry Canyon, which had partial implementation. It was determined that the BMPs were effective on all of the assessed projects, except Campbell, which where effectiveness was determined to be fair/good (Leffert, 2004).

About 41% of the National Forest System lands in the Upper Blackfoot watershed are in RFP management prescription 5.2-Forest Vegetation Management. Vegetation management is an important tool for restoring or maintaining historic disturbance regimes. By returning disturbances to the land, within the natural range of variability, the risk of uncharacteristic disturbances, such as catastrophic wildfire, can be reduced. Reducing this risk helps conserve soil resources.

Land use Affecting Erosion Processes: Motorized Recreation/Access (Key Question #4)
Native surface roads and trails are prone to erosion due to the bare, compacted tread and a lack of vegetative cover (Seyedbagheri, 1996). Well designed roads and trails, with maintained drainage systems, and appropriate level and season of use, on suitable soils can have low erosion rates. Lack of maintenance and use during periods of low soil strength can increase damage such as accelerated erosion and rutting. Soil impacts tend to be more severe at high elevations, on steep slopes, and on wet, poorly drained soils. Erosion resulting from soil compaction and other adverse off-road vehicle impacts, such as trail widening or multiple trails, are generally greater in wetter soils especially if subjected to heavy use (Meyer 2002).

Off-road vehicle use can result in reduced soil stability, soil fertility, soil moisture retention, and increased wind and water erosion (Belnap *et al*, 2001). The Forest Roads Analysis Report (2002) contains an assessment of Forest Roads. This document supported the travel management decisions in the Caribou Travel Plan FEIS (2005). These documents contain assessments of the effects the key travel routes on erosion and mass stability (USDA-FS, 2002). Standards and guidelines for the transportation system are listed in the Revised Forest Plan (RFP 3-37).

The Roads Analysis Report (2002) contains a watershed risk assessment based on sensitive soils. The sub-watersheds in the Upper Blackfoot Watershed analysis area are rated primarily low to moderate risk. There are unstable landforms in the northeastern corner of the watershed, and this area was rated high risk (USDA Forest Service, 2002).

Effects from User-Created Routes
When travelers establish new routes, especially to avoid trail obstructions and crossing difficult terrain or wet areas, the subsequent compaction and erosion can reduce soil productivity. These "pioneered" routes have not been dedicated to transportation uses and are not included in the Forest transportation system. User-created roads and trails are more likely to erode than those that have been engineered and maintained.

In the Caribou Travel Plan Revision Final EIS, the Forest Supervisor made the decision to designate specific roads and trails for specific uses, and restrict motorized travel to these designated routes in the Upper Blackfoot Watershed (USDA Forest Service, 2005). Existing routes not designated were marked as closed. As new user-created routes are identified, they are also closed. There is an ongoing need for travel plan enforcement, and quick identification and effective closure of non-system routes.

Land use Affecting Erosion Processes: Dispersed Recreation (Key Question #5)
Dispersed camping affects soil quality by disturbing the vegetation and causing compaction (Meeuwig *et al*, 1975). Bare, compacted soils are common at popular dispersed camping sites, but this impact is small, scattered disturbance, and has little overall effect. Resource problems can occur where multiple popular dispersed sites occur within the riparian area. One area of concern for dispersed recreation in the Upper Blackfoot watershed is along Diamond Creek. See the Recreation Section for more specifics. A resource need is to investigate soil impacts from dispersed recreation in this area and mitigate any identified impacts.

Because of the extent and amount of disturbance related to recreation use along Diamond Creek, an investigation of soil resource effects and an inventory of restoration needs should be completed and implemented.

Plan Objectives and Regulatory Constraints

The Revised Forest Plan provides goals and direction to protect long-term soil productivity and comply with the National Forest Management Act (NFMA) and the Clean Water Act (CWA). This direction includes limiting detrimental soil disturbances and retaining ground cover. To insure management is leading toward the desired future condition described in the RFP (RFP 3-5), standards and guidelines are also provided (RFP 3-6 and 3-7) along with direction from the USDA Forest Service Soil Management Handbook to maintain or improve long-term soil productivity and hydrologic function.

The Forest Plan also emphasizes certain management and restoration activities for the different Ecological Subsections. These management emphasis items are designed to help prioritize management action. For the Webster Ridges and Valleys Subsection, which the majority of the watershed is located in, the priorities include:

- Restoration of deteriorated rangelands, particularly tall forb communities
- Management of phosphate reserves and forested vegetation
- Restoration and protection of Yellowstone cutthroat trout strongholds (RFP 4-14)

Management Emphasis for the Caribou Range Overthrust Mountains Subsection the priorities are:

- Restoration and regeneration of the aspen ecosystem, focusing on areas succeeding to conifers.
- Wildland fire use, particularly in the higher elevations where other treatment methods would not be effective.
- Retention of primitive and semi-primitive recreation opportunities
- Wildlife security areas and primitive backcountry hunting experiences
- Linkage habitat between the Caribou and the Targhee, and within the Greater Yellowstone Ecosystem
- Historic value of past mining activities.
- Restoration and protection of Yellowstone cutthroat trout strongholds (RFP 4-9)

Management Prescriptions also affect soil resources by guiding management emphasis and acceptable disturbances for different parcels of land. Management Prescriptions for the National Forest System lands in the Upper Blackfoot watershed include the following:

- 2.1.2- Visual Quality Maintenance
- 2.1.5- Lander Trail Special Emphasis Area
- 2.7.1- Elk and Deer Winter Range Critical
- 2.7.2- Elk and Deer Winter Range
- 2.8.3- Aquatic Influence Zone
- 3.2- Semi-Primitive Recreation
- 3.3- Semi-Primitive Restoration
- 4.1- Developed Recreation Sites

- 5.2- Forest Vegetation Management
- 6.2- Rangeland Vegetation Management
- 8.1- Concentrated Development Areas
- 8.2.2- Phosphate Mine Areas

These management prescriptions are described in detail in the Revised Forest Plan. A spatial distribution is shown on Map 7 in Appendix A.

Forest Plan Desired Future Conditions
The desired future conditions are that soils have adequate protective cover, adequate levels of soil organic matter (litter), and coarse woody materials for long-term nutrient cycling. Physical, chemical and biological processes in most soils function to sustain the site (RFP p. II-2 and III-6).

Forest Plan Forest-wide Standards and Guidelines
The goal of the following standards and guidelines is to keep erosion within soil loss tolerance limits and maintain long-term soil productivity.

1) Landtypes identified as being unstable or marginally unstable in the Caribou National Forest Soil Resource Inventory shall be ground verified prior to soil disturbing activities to determine the capability of the land to sustain resource development activities including road construction. (Standard)
2) Suitability for resource management activities shall be disclosed in the site-specific analysis. (Standard).
3) For ground-disturbing activities where detrimental soil disturbances occur on areas of 10 acres or greater, plan and implement rehabilitation to meet desired future conditions. (Standard)
4) On landtypes where landslides or landslide prone areas have been identified, a site-specific analysis shall be conducted to ensure project implementation is compatible with desired future conditions. (Standard)
5) Resource developments and utilization should be restricted to lands identified in the Soil Resource Inventory as being capable of sustaining such impacts. (Guideline)
6) Maintain ground cover, microbiotic crusts, and fine organic matter that would protect the soil from erosion in excess of soil loss tolerance limits and provide nutrient cycling. (Guideline)
7) Detrimental soil disturbance such as compaction, erosion, puddling, displacement, and severely burned soils caused by management practices should be limited or mitigated to meet long-term soil productivity goals. (Guideline)
8) Reduce soil erosion to less than the soil loss tolerance limits on lands disturbed by management activities within one growing season after disturbance. (Guideline)
9) Sustain site productivity by providing minimum amounts of woody residue 3” or greater in diameter dispersed on (forested) sites. (Guideline)

Region 4 Soil Management Handbook FSH 2509.18 Direction
This handbook directs managers that no more than 15 percent of an activity area should have detrimentally disturbed soil after the completion of all management activities.

Region 4 Soil and Water Conservation Practices Handbook FSH 2509.22 Direction
This handbook provides practices that reference FSM and FSH direction.

4.4 Fisheries and Fisheries Habitat

Issue indicators:
- **Population and Presence**
- **Channel & Habitat Disturbances**
- **Barriers**
- **Non Native Species and Disease**

It was difficult to establish a date that clearly defines the separation between past and current conditions. If data existed, good separators could have been when Blackfoot Dam was constructed or when extensive phosphate mining was initiated in the watershed. However, insufficient data exists pre-dam or pre-phosphate mining. Somewhat arbitrarily, I established the separation date for the fisheries analysis to be 1990 because there appears to be a large amount of data available in the 1960's through the 1970's and then in the 1990's through today. I tried to stay true to that division between past and current conditions for the purpose of clear discussion in this document.

Current Condition

Blackfoot River

The occurrence of Yellowstone cutthroat trout in the Blackfoot River drainage is relatively widespread, but so is the presence of nonnative salmonids. Meyer and Lamansky (2003) assessed the composition of the Blackfoot River salmonid community in 2002 and determined that above the Blackfoot Reservoir, 79% of the sites where fish were present contained Yellowstone cutthroat trout, but 55% also contained either rainbow trout or brook trout. In comparison, 59% and 26% of sites below Blackfoot Reservoir contained cutthroat trout and nonnative trout, respectively. Yellowstone cutthroat trout were 34% more likely to occur at a given study site above the reservoir than below it, but nonnative trout were 112% more likely to occur above the reservoir than below it. Cutthroat trout appeared to be more likely to occur in higher gradient, wider, headwater locations on public land, with higher amounts of gravel, cobble, and boulder substrate and less fine sediment substrate. These stream characteristics explained 51% of the variation in cutthroat trout occurrence.

Idaho Department of Fish and Game operates an upstream migrant trap in the Blackfoot River Narrows to enumerate adult adfluvial Yellowstone cutthroat trout and to remove rainbow trout and cutthroat/rainbow hybrids. This approach has apparently met with some success. However, there is still a need to address the reproducing populations of rainbow trout that spend their entire life history upstream of the weir (Campbell and Cegelsky 2003).

The 1,720-acre Blackfoot River Wildlife Management Area was established in 1995 with a land purchase from the Stocking Ranch. Its purpose is to improve public access to the Blackfoot River, improve Yellowstone cutthroat trout habitat, and provide diverse upland and riparian communities (IDFG 2007).

In recent years, there has been an expansion of double-crested cormorant and American white pelicans nesting on Gull Island in the Blackfoot Reservoir. In 2003, there were 1,672 pelicans and 694 cormorants nesting on Gull Island. Those adult birds and their young consumed an estimated 194 metric tons of fish between May 1 and July 31, 2003 (Teuscher et al. 2005). They primarily preyed upon Utah chub, Utah sucker, carp, yellow perch, dace, and rainbow trout. They preyed upon Yellowstone cutthroat trout also, but to a lesser degree. This is consistent with the fish community composition within the reservoir (Yellowstone cutthroat trout make up a small component of the available fish in the reservoir.). During drought years, the reservoir is drawn down substantially when the Yellowstone cutthroat trout are migrating from the reservoir upstream to spawn. They must migrate through a simplified river that flows through the drawdown zone of the reservoir, with no complexity or cover to protect them against avian predators. Idaho Department of Fish and Game personnel that operate the upstream migrant trap in the Blackfoot River Narrows report most Yellowstone cutthroat trout that survive the avian predator gauntlet during drought years and are collected in the trap are wounded from altercations with predators (Teuscher 2008). Teuscher et al. (2005) determined that the approach to stocking rainbow trout in the reservoir would have to change to address the significant loss to avian predation because it is currently an avian supplemental feeding program.

According to IDFG Regional records, the agency has installed one diversion screen on a diversion to the Blackfoot River they call the Hunsaker Diversion. It is located below the upper Narrows.

Since 2000, only sterile rainbow trout have been stocked in Blackfoot Reservoir and more recently these trout have been sex-reversed females, which not only are sterile, but do not exhibit spawning migration or spawning behavior. Additionally, beginning in 2001, all rainbow and hybrid trout sampled from the upper Blackfoot system have been removed and anglers have been encouraged to harvest these fish (IDFG 2007).

The 2005 Caribou-Targhee National Forest Aquatic Organism Passage Survey Crew performed 22 partial and 4 full surveys on crossings within the Upper Blackfoot Watershed to determine the ability of culverts to pass upstream-migrating aquatic organisms. In the survey, only 1 culvert was identified as a full passage barrier. This was the South Stewart Creek culvert located 0.5 mile up FS Road 102. Correcting this passage problem would provide 1.42 additional miles of habitat to migratory Yellowstone cutthroat trout. Brook trout occur in Diamond Creek, so the potential of an unintended colonization of brook trout in the system must be considered prior to treatment.

The Blackfoot River Road has been surfaced with several magnesium chloride applications for the first few years of the 21st Century. The Forest funded this project in an attempt to decrease sediment delivery to the river along this highly used road segment. There has not been a recent application to this road segment in the last few years.

Idaho Department of Environmental Quality sampled fish tissue for selenium concentrations throughout the Blackfoot River and determined the overall average tissue selenium concentration to be 4.77 mg/kg. The river segment with the highest mean sample of selenium in fish tissue (8.60 mg/kg) was between the Narrows and the mouth of Dry Valley Creek. The river segment with the highest reading of selenium in an individual fish tissue sample (18.80 mg/kg) was within the first 2 miles of river upstream of the reservoir (IDEQ 2008). IDEQ (2008) sampled the upper

segment of Blackfoot Reservoir and documented an average fish tissue concentration of selenium of 3.24 mg/kg and an individual high reading of 5.68. Selenium bioaccumulates in components of the aquatic ecosystem and can affect reproductive success and cause deformities in fish.

In the Fall of 2007, IDEQ sampled sculpin in the Blackfoot River and documented high selenium concentration in their tissue. Concentrations ranged from 18 to 32 ug/g (IDEQ 2008a). In the Fall of 2007, IDEQ sampled cutthroat trout tissue selenium concentrations in the Blackfoot River and found them to range between 13 and 20 ug/g (IDEQ 2008a).

Lanes Creek

Reaches of Lanes Creek were surveyed on private land in the Browns Canyon area by the Idaho Soil Conservation Commission (2000). Approximately 3,000 feet upstream of the mouth of Browns Canyon, Lanes Creek was classified as nonfunctional, with 60-70% of the stream banks uncovered and unstable. In this area, bluegrass communities dominate the riparian area. With few deep-rooted species present, Lanes Creek is moving laterally. The only stable stream banks in this reach were well-vegetated with sedge. There was no regeneration of shrubs documented in the reach. The stream was described as wide and shallow and actively eroding laterally. The Idaho Soil Conservation Commission noted a decrease in beaver activity in some of their survey reaches. In some cases, the lack of beaver activity increased severe erosion. Channel incision has occurred and the water table may be lowering. The instability is in a general location of past willow spraying and may have been initiated by the spraying project.

The Forest Fisheries Crew performed a fish distribution survey on Lanes Creek in 2002. The survey extended from the Forest boundary to the Lanes Creek headwaters. While surveying upstream from the Forest boundary, the first half of the stream was a Rosgen B channel type but transitioned further upstream to a C channel type. The stream substrate was primarily cobble and gravel, but had a heavy layer of sediment over it. The riparian area was dominated by conifer in the overstory and grass in the understory. The dominant conifers shifted from lodgepole pine, to Englemann spruce, to subalpine fir, then back to lodgepole pine as the survey progressed upstream. In some units, willow also occurred in the riparian area. The stream moved slowly through the reach. Both old and new beaver dams occurred in the reach. Channel stability was rated as poor. The upper reach of the stream was also affected by fine sediment loading. Large wood was more frequent in this reach. Through this reach, the Rosgen channel type transitioned from a B to a C. The most upper part of the stream had an E channel type with beaver activity present. The channel stability was rated as fair. Sculpin and Yellowstone cutthroat trout were collected in Lanes Creek during the survey. FS Road 139 encroaches upon Lanes Creek affecting sediment loads and riparian vegetation.

Sheep Creek

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Sheep Creek and documented an average of 2.55 mg/kg from a sample of 2 fish. The highest selenium concentration documented in Sheep Creek was 3.60 mg/kg.

Daves Creek

Daves Creek was surveyed by the Forest Fisheries Crew in June 2002. No fish were captured during the survey. Daves Creek on the Forest is a high gradient riffle with predominantly gravel

substrate. However, all other substrate sizes also occurred in the stream. Rocks tended to be flat and resembled shale. The stream banks closer to the Forest boundary were sparsely vegetated with grass and forbs. Lodgepole pine provided the dominant overstory. Moss was abundant along the stream banks and on rocks. Large woody debris was frequent in the stream channel. Further upstream, the stream flowed through a meadow-like area. The stream banks were more densely vegetated with grasses and forbs and stream bank stability was rated as fair. Grazing impacts were noted along Daves Creek (Christensen 2002).

Olsen Creek
The Forest Fish Crew performed a fish distribution survey on Olsen Creek in June 2002 that extended from the Forest boundary upstream for approximately 0.8 miles. The stream flowed through a meadow with forbs and grasses dominating the understory. The stream substrate was dominated by gravel and fine sediment. The edge of the meadow included Englemann spruce, subalpine fir, and Douglas fir. Stream banks were damaged by past livestock grazing, but were recovering. Beaver dams were present. A low density brook trout population was documented in the stream (Christensen 2002).

Lander Creek
A fish distribution survey was conducted on Lander Creek (tributary to Lanes Creek) from the Forest boundary to its headwaters by the Forest Fish Crew in 2002. Only Yellowstone cutthroat trout were observed, although in low population densities. The habitat was in good condition. Most of the stream was a Rosgen B channel type. Grass and sedge lined the stream banks, with willow dominating the overstory in lower units converting to Englemann spruce, subalpine fir, and lodgepole pine in the overstory as the stream survey gained elevation. Stream substrate was dominated by gravel and cobble, with some fines (Christensen 2002).

Corrailsen Creek
Corrailsen Creek is a tributary to Lanes Creek. The Forest Fisheries Crew performed a fish distribution survey there in late June 2002 (Christensen 2002). Only Yellowstone cutthroat trout were observed. The stream was subsurface at the Forest boundary, but the stream channel was wetted approximately 1/3 mile upstream of the boundary. The substrate of Corrailsen Creek was dominated by fine sediment. The lower half of Corrailsen Creek on the Forest had riparian areas dominated by conifer in the overstory and grasses, sedges, and willow in the understory. There were some areas where no overstory existed. The reach had several areas of exposed banks that contributed to mass wasting. The watershed appeared to be naturally unstable with somewhat erosive soils. The upper half of the stream on the Forest was low gradient. Although the substrate was primarily gravel, it was heavily silted in. The riparian area was conifer and grasses. The stream in upper Corrailsen Creek was slow moving. Muddy ponds provided good habitat for amphibians. Tiger salamanders were observed (Christensen 2002).

Browns Canyon Creek
In 2002, the Forest Fisheries Crew performed a fish distribution survey on Browns Canyon Creek. Browns Canyon Creek is considered a Yellowstone cutthroat trout stronghold stream. Although brook trout also occurred in the stream, their numbers were low and probably kept in check by a migratory component to the cutthroat trout population. Sculpin were also collected. Habitat quality was considered good. Much of the lower and middle reaches had moderate amounts of

large instream wood that provided good cover and slowed water velocities. The stream banks were generally stable with good undercuts. The stream substrate was primarily sand and silt in slow water areas and cobble, boulder, and bedrock in the faster water areas. The lower stream reach riparian area was dominated by conifer that shaded the stream well and provided large wood to the stream. Stream substrate was dominated by cobble, boulder, and bedrock where the stream was confined and sand and silt when the stream flowed slowly through meadows. The middle reach was low gradient meadow habitat with riparian areas dominated by willow. The stream was less shaded. The stream was influenced by beaver. The upper reach had low flow. The riparian area was dominated by lodgepole pine and subalpine fir and was well shaded. The stream substrate was dominated by fines, but also had large gravel and cobble. Use by livestock was evident, but the use did not negatively affect habitat quality. The survey crew reported a road washout where the Flat Valley Road crosses Brown Canyon Creek and several riparian dispersed campsites encroaching upon the stream (Christensen and Gamett 2002).

In the Fall of 2007, IDEQ sampled cutthroat trout tissue selenium concentrations in Browns Canyon Creek and found them generally under 4 ug/g (IDEQ 2008a). A recent study by IDFG, IDEQ, and others consider Browns Canyon a control stream, not directly affected by mining-related selenium (Teuscher 2008).

Bacon Creek

Bacon Creek flows in a westerly direction into Diamond Creek. Approximately 0.5 mile of Bacon Creek was surveyed by the Forest Fisheries Crew in 2002, from the Forest boundary upstream. Primarily Yellowstone cutthroat trout were collected. A small percentage of the salmonid community was rainbow trout. Sculpin were also collected. Due to the multiple life history patterns of Yellowstone cutthroat trout, the high frequency of Yellowstone cutthroat trout, and quality habitat, Bacon Creek is an important Blackfoot River tributary, in terms of Yellowstone cutthroat trout conservation. Just above the Forest boundary, the stream exhibits a B Rosgen channel type. It appeared to be within the remnants of an old beaver dam complex. The stream substrate was mostly cobble with some boulder. Banks were deeply entrenched and sloughing. There were little shade or cover in the unit. There was a high frequency of aquatic macroinvertebrates within the unit. More recent beaver activity occurred upstream of there, in the middle unit. Most of the stream substrate there was silt. The riparian vegetation consisted of grass, sedge, willow, and Indian paintbrush. Most of the stream banks were undercut. The stream channel type was classified as a C. Further upstream, in the upper unit, the stream meandered within a lodgepole pine forest with grass and forbs as the riparian vegetation in the understory. One stream bank downstream of the sample unit was mass wasting. The stream substrate in the upper unit was primarily cobble.

Diamond Creek

In 1990, the Forest Hydrologist Leffert collected fish habitat information on Diamond Creek near the forest boundary. Pools were in good overall condition but less than optimum quality: vegetative cover was below potential and pool bottoms were silt-covered. Riffles were, for the most part, highly embedded with silt. Bank vegetative cover was good to excellent consisting of willows, sedges, and grasses. Some lateral migration in the form of cut banks was noted. Ocular investigations of the channel and fisheries habitat above the forest boundary indicated habitat to be in good overall condition. Below Forest boundary, habitat was in poor to very poor condition with

downcutting channel, raw banks, large width to depth ratios, increased amounts of aquatic vegetation, and turbid water. Overall, the stream was in fair to good condition depending on location (IDEQ 2001).

Diamond Creek was surveyed by the Soil Conservation Commission (2000) from Yellowjacket Creek to upstream of Stewart Canyon. While the lower reaches appeared to be in good condition with sedge and willow dominated riparian vegetation, low amounts of sedimentation, and good insect production, the upper reaches (near Stewart Canyon) had some incised channel segments, high amounts of fine sediment, some bank instability, and generally poor aquatic habitat.

The Forest Fish Crew performed a fish distribution survey on Diamond Creek in July 2002. It began at the Forest boundary and extended up to the headwaters. Reach 1 extended from the Forest boundary upstream to the mouth of Hornet Canyon. The riparian vegetation was dominated by willows (coyote and Drummonds) and grasses. The Rosgen channel types within this reach were generally C-3, C-4, And C-5, with a B-3 inclusion near the start of the reach. Channel stability was rated fair and willow growth contributed to stream bank stability. Stream substrate was dominated by gravel and small cobble. Water temperatures ranged between 10 and 14C. There were some dry areas in this reach, although these areas appeared to flow well earlier in the year.

Reach 2 extended from the mouth of Hornet Canyon to near Johnson Guard Station. The Rosgen channel type was primarily C with some E inclusions. The stream channel stability was rated as fair, although some stream bank instability was documented. The stream substrate was dominated by cobble. Beaver activity was observed, including dams. Riparian vegetation was dominated by willow and grasses with some lodgepole pine in places. Water temperatures ranged from 15 to 18C.

Reach 3 extended from Johnson Guard Station to the mouth of Timber Creek. The Rosgen channel type transitioned between a C and B as the survey proceeded upstream. Channel stability was rated as fair as stream bank impacts from cattle grazing were evident. In one area of this reach, a stream bank protection project using tree revetments and hardened water gaps was implemented. Stream substrate was dominated by cobble. Water temperature ranged from 14 to 18C. Riparian vegetation was dominated by willows, grasses, and sedges, with some occasional lodgepole pine.

Reach 4 extended from the mouth of Timber Creek to Lone Pine Spring. The Rosgen channel type of this reach was primarily a C, but some B and E units existed. Stream channel stability was rated as fair. Water temperatures ranged from 16 to 20C. Riparian vegetation was dominated by willow and grasses. Livestock impacts were documented in this reach. Beaver activity was also observed.

Reach 5 extended from Long Pine Spring to the mouth of an unnamed tributary approximately 2 miles upstream. The lower part of the reach was primarily Rosgen channel type C and the upper part of the reach was primarily Rosgen E channel type. Willows, sedges, and grasses dominated the riparian area, but trees (lodgepole pine, and subalpin fir) were more evident than previous reaches. Sedges held the banks together well and undercut banks were common. Water

temperatures ranged from 11 to 15C and stream substrate was dominated by gravel, cobble, and silt.

Yellowstone cutthroat trout and brook trout both occurred in Diamond Creek at approximately and even ratio. Sculpin were also observed (Christensen 2002).

In the Fall of 2007, IDEQ sampled sculpin tissue selenium concentrations in Diamond Creek that ranged from 6 to 10 ug/g (IDEQ 2008a). A recent study by IDFG, IDEQ, and others considered Diamond Creek as a background stream, not directly impacted by mining-related selenium, but potentially affected by natural releases of selenium in the drainage.

Spring Creek

Idaho Department of Environmental Quality (2001) performed a Beneficial Use Reconnaissance Project survey on Spring Creek in 2001. They sampled 2 areas; lower Spring Creek 50 meters upstream of the Forest boundary and upper Spring Creek upstream of the mouth of East Fork Mill Creek. In lower Spring Creek, they collected all native fish; Yellowstone cutthroat trout, sculpin, dace and sucker. Further upstream, they collected only sculpin and non-native brook trout. They collected some fish tissue samples for Tetra Tech to test for selenium in the upper sample site.

In 2006, IDEQ and FS personnel sampled water quality in Spring Creek and determined that selenium concentrations exceeded chronic aquatic life criteria (IDEQ 2006).

Spring Creek was sampled for fish tissue selenium concentration upstream and downstream of the mouth of East Mill Creek by Idaho Department of Environmental Quality (2008). Upstream of the mouth of East Mill Creek, concentrations of selenium in fish tissue were low (1.61 mg/kg average (3 fish sampled) and 3.26 mg/kg maximum). Selenium concentrations were considered higher downstream of the mouth of East Mill Creek (3.68 mg/kg average from 3 fish sample and 7.38 mg/kg selenium concentration in fish tissue). This likely reflects the selenium concentrations contributed to Spring Creek from East Mill Canyon.

Timothy Creek

The Forest Fisheries Crew performed a fish distribution survey on Timothy Creek, a tributary to Diamond Creek, from the Forest boundary upstream, in July 2002. The entire surveyed reach was a Rosgen B channel type. Flows were swift and high. The channel was well-defined and well-reinforced in many places with cobbles and boulders. Fast-moving riffles were dominant habitat types, with little pooling or slower moving water. Cobble dominated the stream substrate. The upper units surveyed had large coarse sand deposits. There were high numbers of aquatic invertebrates present throughout all survey units. Most of the stream length surveyed was unforested and meadow-like, bordered by willow, birch, and red-osier dogwood. Grass and forbs dominated the riparian vegetation. The stream had little shade or overhanging cover. Most units surveyed had severe sheep grazing impacts. The salmonid community was diverse and included Yellowstone cutthroat trout, rainbow trout, and brook trout. The low numbers of juveniles indicate large fish may spawn in the upper watershed and most of the juveniles get washed downstream to lower gradient and slower waters (Christensen 2002).

Cabin Creek
The Forest Fisheries Crew visited Cabin Creek in 2002. A tributary to Diamond Creek, it had extremely low flow and was not sampled. Aspen dominated its riparian overstory and sedge and willow lined the stream banks. The stream substrate appeared to be dominated by fines due to the marsh-like conditions. A large pond occurred below the Forest boundary. Cabin Creek was determined to likely be fishless during the year of the survey.

Yellowjacket Creek
The Forest Fish Crew performed a fish distribution survey on Yellowjacket Creek, a tributary of Diamond Creek, from the Forest boundary upstream, in July 2002. It was apparently the first survey of this stream. The stream was shallow and appeared to run through a ditch. The survey reach was classified as a Rosgen B channel type. The sample units had a riparian area that consisted of lodgepole pine in the overstory and grasses, horsetail, and forbs in the understory. Willows were also present. The upper units had high frequencies of large instream wood and had good stream meander. No fish were observed (Christensen 2002).

Coyote Creek
Coyote Creek was surveyed by Platts in 1975 and supported a small population of Yellowstone cutthroat trout. It has not been surveyed since.

Bear Creek
Bear Creek was surveyed by Platts in 1975 and supported a small population of Yellowstone cutthroat trout. It has not been surveyed since.

Timber Creek
A fish distribution survey was conducted on Timber Creek by the Forest Fisheries Crew in June 2002. Timber Creek provided diverse habitat. The Rosgen channel types transitioned from a D, to a C, and finally B. Several beaver complexes occurred within the stream. Grass, sedges, and willows were common in the riparian area understory and some units had lodgepole pine and subalpine fir in the overstory. Yellowstone cutthroat trout were the only salmonid captured in this stream. Sculpin were also collected (Christensen 2002).

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Timber Creek and documented an average of 4.33 mg/kg from a sample of 6 fish. The highest selenium concentration documented in Timber Creek was 8.34 mg/kg. A recent study conducted by IDFG, IDEQ, and others document consider Timber Creek a control stream, relatively unaffected directly by selenium impacts from mining activities (Teuscher 2008).

Stewart Canyon Creek
The Forest Fisheries Crew performed a fish distribution survey on Stewart Canyon Creek in July 2002 and observed no fish. An impassable culvert at the FS Road 102 crossing had an impassable culvert that may have limited access to the stream above the road, but Yellowstone cutthroat trout were reportedly observed in Stewart Canyon Creek in previous years. The stream had a Rosgen channel type of B. Stream substrate was generally gravel, cobble, and fines, with larger boulder sized material farther upstream. The riparian area was densely vegetated with willow, lodgepole

pine, Englemann spruce, and subalpine fir in the overstory and grass and forbs in the understory. All sample units had large wood associated with them. The unit located downstream of the FS Road 102 crossing had high amounts of fine sediment (Christensen 2002). Fish passage was improved at the FS Road 102 crossing of South Stewart Canyon Creek with the replacement of a perched, under-capacity culvert in 2005. The old culvert had downcut and eroded the downstream stream bank and those impacts have not yet been addressed.

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Stewart Canyon Creek and documented an average of 6.46 mg/kg from a sample of 6 fish. The highest selenium concentration documented in Stewart Canyon Creek was 9.73 mg/kg which exceeds the fish tissue selenium criteria proposed by U.S. Environmental Protection Agency.

Hornet Creek
Hornet Creek was visited by the Forest Fisheries Crew in July 2002 and determined to be dry and fishless. Willow and lodgepole pine vegetated its riparian area in the overstory while grasses and forbs dominated the understory. There was a defined stream channel and the stream substrate appeared to be primarily cobble (Christensen 2002).

Campbell Creek
Campbell Creek, a tributary to Diamond Creek, was visited by the Forest Fisheries Crew in July 2002 and was determined to be dry and fishless. Willow, aspen, and lodgepole lined the banks of the stream in the understory and grasses and forbs dominated the understory (Christensen 2002). Diamond Creek was also dry at its confluence with Campbell Creek in July 2002.

Kendall Creek
Kendall Creek was surveyed by the Department of Environmental Quality Beneficial Use Reconnaissance Project Team in July 2001. The stream temperature was cool at 7.2C and cutthroat and brook trout were collected (IDEQ 2001). They returned to Kendall Creek in 2006 and again sampled cutthroat trout and brook trout. Although both sample efforts collected different numbers of fish, the composition of the salmonid community was consistent. The cutthroat trout outnumbered the brook trout 2:1.

The Forest Fisheries Crew performed a fish distribution survey on Kendall Creek from the Forest boundary upstream in late June 2002 and found no fish. Lower Kendall Creek was a C Rosgen channel type. There was a high frequency of gravel in the stream substrate, providing for great spawning habitat. Riparian vegetation included lodgepole pine, subalpine fir, willows, grasses, and sedges. While some areas had good stream bank stability and good undercutting, other areas, particularly where the road begins to veer away from the stream, stream banks had been impacted by sheep. In sheep-impacted areas, banks were shallow and bare, contributing sediment to the stream. Upper Kendall Creek was a B Rosgen channel type with a cobble stream substrate. Large conifers such as lodgepole pine, subalpine fir, and Douglas fir provided shade to the stream. Stream channel stability was rated good (Christensen 2002).

Mill Canyon (East Mill) Creek
Robert Brassfield (2008), the Soda Springs Ranger District Fisheries Biologist in the 1990's, report observing fish in East Mill Creek in the past. However, more recent surveys have resulted

in less fish observations. A fish distribution survey was performed by the Forest Fisheries Crew on Mill Canyon Creek in 2002. The stream was deeply entrenched, indicating past downcutting. The stream substrate was dominated by gravel and cobble, with a high frequency of fine sediment throughout the stream. Stream bank undercutting was observed throughout the survey. Riparian vegetation was dominated by lodgepole pine and willow and aspen in the overstory and grasses and sedges in understory. The upper unit was in an open sedge meadow. Only 2 Yellowstone cutthroat trout were collected in the stream. No other fish were observed. It is unclear how Mill Canyon Creek connects to the Blackfoot River since it is on private land and apparently has not been surveyed (Christensen 2002).

In 2006, IDEQ and FS personnel sampled water quality in Mill Canyon Creek and determined that selenium concentrations exceeded chronic aquatic life criteria (IDEQ 2006). In 2001, the Idaho Fish Consumption Advisory Program Committee issued a fish consumption advisory for East Mill Creek as a precautionary action (Tetra Tech EM Inc 2002).

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in East Mill Creek and documented an average of 24.94 mg/kg from a sample of 11 fish. The highest selenium concentration documented in East Mill Creek was 52.30 mg/kg. These values greatly exceed the fish tissue selenium criteria proposed by U.S. Environmental Protection Agency.

Angus Creek

A fish distribution survey was performed on Angus Creek by the Forest fisheries crew in 2001. Dace, sucker, sculpin, and shiner were collected in low numbers. Only 2 YCT were collected in 200 m of stream sampled. Beaver activity was recent and frequent (USFS 2001). The Forest Fish Crew watched closely in their catch for leathersides (documented present in Angus Creek in the past), but did not observe any. IDEQ (2000) performed their BURP survey on Angus Creek in 2000 near the section of state land and documented shiner, dace, sucker, and sculpin. Three YCT were documented in the 100 meters sampled.

The Idaho Soil Conservation Commission (2000) surveyed lower Angus Creek and observed it was protected by an exclusion fence. The fence had been effective in maintaining quality habitat. Sedges dominated the riparian vegetation and the frequency of willows appeared to be increasing. Stream bank composition was primarily sand and silt and stability was high.

In 2006, IDEQ and FS personnel sampled water quality in Angus Creek and determined that selenium concentrations exceeded chronic aquatic life criteria. The criteria has been exceeded 2 out of the last 3 samples, so the stream will be listed as 303(d) for selenium contamination upon list revision (IDEQ 2006). Hamilton and Buhl (2005) reported upper Angus Creek exceeded selenium standards, with a moderate hazard to have adverse impacts upon aquatic resources.

In the Fall of 2007, IDEQ sampled sculpin tissue selenium concentrations in Angus Creek that ranged from approximately 5 to 10 ug/g (IDEQ 2008a). Previously, Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Angus Creek and

documented an average of 3.54 mg/kg from a sample of 6 fish. The highest selenium concentration documented in Angus Creek during these previous efforts was 6.70 mg/kg.

In the Fall of 2007, IDEQ sampled brook trout tissue selenium concentrations in Upper Angus Creek that were approximately 10 ug/g (IDEQ 2008a). In the Fall of 2007, IDEQ sampled cutthroat trout tissue selenium concentrations in Upper Angus Creek that ranged from approximately 3 to 6 ug/g (IDEQ 2008a). In the Fall of 2007, IDEQ sampled cutthroat trout tissue selenium concentrations in Angus Creek and found them to range between 4 and 9 ug/g (IDEQ 2008a).

Mill Creek
In 2001, the Soda Springs Ranger District Office replaced the undersized, perched culvert under the Narrow Road at Mill Creek with one that facilitated the upstream migration of Yellowstone cutthroat trout into the stream. Mill Creek was surveyed by the Forest Fisheries Crew in June 2002 (Christensen 2002). Most of the stream had a Rosgen channel type B and stream substrate primarily consisted of gravel and sand and most of the stream was low gradient riffle, with very few pools. Willow was the dominant overstory vegetation in most of the riparian areas. The dominant understory was composed of grasses and sedges. Most of the stream was within a campground with many campsites very close to the stream. Yellowstone cutthroat trout were the only salmonids collected in the stream. Sculpin were also documented.

Trail Creek
Berg (2003) performed a fish distribution survey on Trail Creek and was unable to sample any fish there, although anglers have reported catching cutthroat trout and brook trout there in recent years. The riparian area was well vegetated and the stream banks were stable. Cover was rated as good with 51-75% of the stream shaded. Active and stable beaver dams were present. There were high frequencies of fine sediment in the stream substrate and this was attributed to the proximity of the archery road (FS Road 297) to the stream, natural conditions, and beaver dams preventing sediment flushing. The poor substrate quality would allow little if any trout reproduction and would prevent the production of diverse macroinvertebrate production for a food base for trout. The FS Road 124 crossing of Trail Creek is often plugged by beaver activity.

Cold Springs Creek, a tributary to Trail Creek, was surveyed for fish by Berg (2003). Fish habitat conditions were considered excellent, aided by a healthy riparian area and stable stream banks. Active beaver colonies were present. The stream was extremely cold, 7.5˚C in August. The stream substrate was very silty. An extremely low density brook trout population was documented there.

Slug Creek
Slug Creek was surveyed by the Idaho Soil Conservation Commission (2000) from the Blackfoot River upstream approximately 6,000 feet. They noted the importance of the survey reach as a migration corridor for Yellowstone cutthroat trout. The riparian area was in good condition, dominated by sedge and bulrush. Stream and bank substrate was dominated by sand and silt.

The Forest Fisheries Crew performed a fish distribution survey in Slug Creek in July 2000. Non-game fish such as dace and redside shiners dominated the stream. There were low densities of

brook trout also collected. The stream flowed through a willow-dominated plant community with an understory of grass and forbs. Upslope vegetation consisted primary of sage brush with some aspen patches. Beaver activity was frequently observed. Frogs were frequently observed in the beaver ponds. The stream had slow currents and high sinuosity. Undercut banks were frequent. Cattle used the stream, but impacts were mild. The stream substrate was dominated by fines (Anderson 2000). A culvert at the FS Road 589 crossing of Slug Creek is perched and may be a barrier to the upstream migration of Yellowstone cutthroat trout (Tate 2008).

Idaho Department of Fish and Game sampled Slug Creek at three locations (upper, middle and lower Slug Creek) for fish populations in August 2001 (IDFG 2002). No fish were sampled in upper Slug Creek. In middle Slug Creek, 12 mottled sculpin, 3 leatherside chub, and 1 brook trout were captured. In lower Slug Creek, 25 Utah chub, 11 Utah suckers, and 3 mountain suckers were captured.

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Slug Creek and documented an average of 2.40 mg/kg from a sample of 2 fish. The highest selenium concentration documented in Slug Creek was 2.40 mg/kg.

In the Fall of 2007, IDEQ sampled brook trout tissue selenium concentrations in Slug Creek that ranged from approximately 5 to 7 ug/g (IDEQ 2008a). A recent study by IDFG, IDEQ, and others considered Slug Creek as a background stream, not directly affected by mining-related selenium but potentially affected by natural geological release of selenium into the system.

Dry Valley Creek

Dry Valley Creek was surveyed with separate reaches throughout from its mouth to headwaters by Idaho Soil Conservation Commission (2000). Dry Valley Creek has been affected by a railroad in the lower watershed and livestock grazing in the upper watershed. A pond mid-way up the stream has a spillway that is down-cutting, threatening failure and resulting erosion and sedimentation. In addition, two 55-gallon drums were observed mid-way up the stream, raising chemical pollution concerns. Willow and sedge dominated the riparian areas. Recent cleanup efforts have apparently addressed these concerns (Kauffman 2008).

In 2006, Soda Springs Ranger District Range Con Vic Bradfield (2008) photographed an airplane spraying a substance on willows along Dry Valley Creek on private land. The type of substance was unconfirmed but may have been to kill willows along the stream. If it was herbicide, it is likely it was applied contrary to label directions, which is inconsistent with federal law.

In Dry Valley Creek, both upstream of Maybe Creek and further downstream, selenium concentrations were well below EPA criteria (Rich 1999). Muscle selenium concentrations in fish collected in Dry Valley Creek varied from 1 to 31 mg/kg dry weight, depending on the species and location. While cutthroat trout collected in the Blackfoot River upstream of the mouth of Dry Valley Creek had the lowest concentration of selenium in their tissue, dace just downstream of the mouth of Maybe Creek had the highest (Rich 1999).

Idaho Department of Environmental Quality (2008) sampled fish tissue selenium concentrations in Dry Valley Creek and documented an average of 6.17 mg/kg from a sample of 11 fish. The

highest selenium concentration documented in Dry Valley Creek was 16.60 mg/kg. This value exceeds the fish tissue selenium criteria proposed by U.S. Environmental Protection Agency.

Mabey Creek
The Soil Conservation Commission (2000) surveyed Mabey Creek mid-way up its stream length. The stream gradient was high at that location. Grass, aspen, and serviceberry dominated the riparian vegetation. Bank stability was estimated at 75-90%.

Selenium concentrations immediately downstream of Maybe Creek and within Maybe Creek were above both the EPA Chronic (5 µg/l) and Acute criteria (20 µg/l) and concentrations which become harmful due to bioaccumulation (Rich 1999).

Johnson Creek
Johnson Creek is a tributary to Slug Creek. It is a small, spring-fed stream that flows out of a canyon onto a broad valley floor. The Forest Fish Crew preformed a fish distribution survey on Johnson Creek from the Forest boundary upstream in July 2000. Johnson Creek is covered with thick adult willow and red-osier dogwood. Understory vegetation consisted primarily of grasses and forbs. Stream substrate was dominated by small cobble and gravel with surface fines. As the survey proceeded upstream, surface fines increased. Stream habitat primarily consisted of low gradient riffles and shallow pools. Undercut banks and rootwads from dense riparian shrubs provided good cover. Management impacts documented by the crew were grazing and roads. The crew documented stream bank trampling by cattle. This is a sheep allotment, so trespass may be occurring. They also noted a dirt road that paralleled the stream, contributing sediment. Only brook trout were collected in the stream (Anderson 2000).

In the Fall of 2007, IDEQ sampled brook trout tissue selenium concentrations in Johnson Creek that ranged from approximately 3 to 5 ug/g (IDEQ 2008a). A recent study by IDFG, IDEQ, and others considered Johnson Creek as a background stream, not directly affected by mining-related selenium, but potentially influenced by natural geological releases of selenium (Teuscher 2008).

Goodheart Creek
No historic fisheries information occurs for Goodheart Creek. A fish distribution survey was conducted on Goodheart Creek by the Forest Fisheries Crew in August 2000. They described it as the most livestock-impacted stream they had surveyed during the 2000 field season. They surveyed nearly 30 streams in the Soda Springs and Montpelier ranger districts that year. Goodheart Creek is grazed by cattle. The stream had little vegetative cover. The stream was non-forested with a narrow riparian area consisting of willows and grasses. Sagebrush dominated the uplands. Goodheart Creek is a small, springfed stream. Most of its flow is from a spring located approximately 1.5 miles upstream from the Forest boundary. Approximately 3.4 mile of the stream is enclosed by an electric fence for a cattle exclosure. While stream banks inside the exclosure were stable and well-vegetated, they were generally unstable outside of it. Goodheart Creek is a C Rosgen channel type with shallow runs and low gradient riffles as the typical habitat types. Water temperatures were high at 25C. No fish were collected (Rugenski 2000).

Since 2001, the exclosure on Goodheart Creek has been extended to further protect the stream (Bradfield 2008).

In 2006, IDEQ and FS personnel sampled water quality in Goodheart Creek and determined that selenium concentrations exceeded chronic aquatic life criteria (IDEQ 2006).

4.5 Wildlife and Rare Plants

Canada lynx (*Lynx canadensis*) – The Caribou NF contain a variety of seral stages in forest and non-forest habitat, with a majority in the older age classes due to a lack of fire. Caribou Forest Plan (2003) standards and guidelines provide for early seral vegetation to reach maturity as outlined in the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000) for lynx habitat. Vegetation in the watershed provides habitat to support linkage between the Greater Yellowstone area and the Uinta Mountains (Ashley NF). The CNF RFP Lynx S&Gs provide for mature forest stands at the time the CNF was considered lynx habitat.

The photo above shows the open, agricultural, urban and industrial land used form the largest physical barrier between suitable linkage habitats on the Caribou NF. US 30 was recently widened to provide passing lanes.

Gray wolf (*Canis lupus*) The Blackfoot River Watershed is within the Yellowstone nonessential experimental population area of the wolf. The State of Idaho began wolf management when the wolf was delisted on March 30, 2008 but a court order returned the wolf's listed status (USFWS 2008b). A pack is located 10 miles north of Herman, Idaho and Grays Lake (USFWS et al. 2008).

Townsend's (Western) big-eared bat (*Corynorhinus townsendii*) maternity and hibernation colonies occur exclusively in caves and mine tunnels. (Groves and others 1997, Spahr and others 1991). There is no known naturally occurring habitat that meets these criteria within the watershed. Other roosting sites may occur in the watershed. They may occasionally use buildings, bridges, and tree cavities for night roosts. They are extremely sensitive to human disturbance. Actual occurrence is unknown but mining and buildings have artificially created roosting habitat.

Pygmy rabbit (*Brachylagus idahoensis*) prefers large dense stands of big sagebrush with high percent woody cover growing in deep, loose sediment. There are currently no known populations in the watershed (Roberts 2003).

Wolverine (G*ulo gulo*) The Blackfoot River Watershed is within the home range of wolverines that may use suitable denning habitat found on Snowdrift Mountain and along the Salt River Range (Ruggiero et. al 1994). Occurrence has been documented on Caribou Mountain, the Bear River Range, and possible wolverine tracks were found on Hawks Peak on the Preuss Range (south of the watershed) (USDA 2002, Inman 2004). Radio collared wolverines are currently occupying the Teton and Grays River ranges. An increase in snowmobile use in suitable denning habitat may impact wolverine reproduction success if they exist in the watershed. Trapping is no longer legal in Idaho but disturbance at den sites can impact population levels. Wolverine has been petitioned to be listed. Wolverine tracks were found in Timber Creek in February 2008. It is not known if this was a disperser or a resident.

Bald eagle (*Haliaeetus leucocephalus*) Nesting occurs along the Blackfoot River in the watershed. Bald eagles are found along large bodies of water and nest in large trees with strong branches to support the weight of their nests. Open water with perch sites and carrion (road kill and wild ungulates) is important winter habitat.

Northern goshawk (*Accipiter gentilis*) nest in a mature & old-growth (aspen and conifer) forest stands with closed tree canopies, high density of large trees on slopes <30% and northerly exposures. They prey on birds & mammals within forest canopy. (Reynolds et al 1991, Groves and others 1997, and Spahr and others 1991). There are at least three known goshawk nests within the watershed. The mature/old Douglas-fir, Aspen, and mixed conifer forested habitat is at or near 100 percent.

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) - use undisturbed native shrub-grassland, with high structural diversity (Paige and Ritter 1999). Sharp-tailed grouse dancing grounds, nest sites, and brood sites are found in areas containing big sage, arrowleaf balsamroot, bluebunch wheat grass, mountain shrub, and riparian cover types. Grass and forbs are needed for cover. (Groves and others 1997 & Spahr and others 1991). CST grouse inhabit rangeland communities in the 12- to 20-inch precipitation zone. Good nesting and brood rearing habitat has been found on the valley bottoms and rolling foothills usually on private or BLM lands around agriculture lands. Several leks are found in the watershed. Mature stands of aspen, chokecherry, and serviceberry provide winter habitat. Very little of the existing acres are in early seral due to lack of recent disturbances in these community types. The percent of early seral mountain brush is 20 percent.

Greater sage-grouse (*Centrocercus urophasianus)* leks are found in the valley bottoms in the watershed off the forest. Sagebrush conditions are not well known in the watershed. Ground cover of non-senescent grasses/forbs as cover/forage is available in rested or deferred grazing pastures. The watershed is within the Eastern Idaho Uplands Planning Area in accordance with the 2006 Idaho Greater Sage-Grouse Conservation Plan (IDFG 2004a). An interagency meeting to identify local stakeholders to form a local working group began in 2006 (IDFG 2006c). The Eastern Idaho Upland Local Working Group has met twelve times with the task of finalizing the "Eastern Idaho Uplands Greater Sage-Grouse Conservation Plan". There is currently an Interim Plan (see IDFG et al. 2004b).

Most of the habitat within the Planning Area is highly managed for agricultural purposes. Large areas of greater sage-grouse habitat have been permanently lost to development or altered through agricultural conversion. The vast majority of the area is grazed, actively farmed or enrolled in set aside programs such as the Conservation Reserve Program administered by the Farm Services Agency. Management activities that enhance these functions are routinely implemented throughout the Planning Area. (IDFG et al. 2004b)

Some greater sage-grouse habitat in the planning area has been permanently lost, some has been converted to other uses but is restorable and some is currently under management. However, the full status of greater sage-grouse habitat is not known for the planning area. A habitat inventory will be part of the process to completing the Final Eastern Idaho Uplands Greater Sage-Grouse Conservation Plan. (IDFG et al. 2004b) The percent of early seral sagebrush, as identified in GIS, is 32 percent.

Sage grouse has been petitioned to be listed as threatened or endangered over nine times. The USFWS (2008a) announced that "the greater sage-grouse will receive additional review to determine if the species warrants protection under the Endangered Species Act (ESA). In January 2005, the Service determined that the greater sage-grouse was not in danger of extinction throughout all or a significant portion of its range, and announced that protection under the ESA was not warranted. An organization called Western Watersheds Project challenged the 2005 finding in federal court. In December 2007, the court remanded the finding back to the Service for further consideration."

Great gray owl (*Strix nebulosa*) use nests abandoned by hawks or on the tops of snags in mature lodgepole pine or subalpine fir forests bordering small openings or meadows (Hayward 1994). They prey on voles, mice etc. along edges of clearings. (Groves and others 1997, 131 & Spahr and others 1991). This owl has been observes in several locations in the watershed. The mature/old Douglas-fir, Aspen, and mixed conifer forested habitat is at or near 100 percent.

Flammulated owl (*Otus flammeolus*) are obligate cavity nesters usually in mature Douglas-fir forests and aspen with open canopies (30-60%) and forage on insects in edge habitat (Hayward 1994, Groves and others 1997, 125 and Spahr and others 1991). Flammulated owls reside in the watershed. The mature/old Douglas-fir, Aspen, and mixed conifer forested habitat is at or near 100 percent.

Boreal owl (*Aegolius funereus*) nest in tree cavities in mature subalpine fir or Engelmann spruce forests with a high density of large trees and forage on small mammals, birds and insects. (Hayward 1994, Groves and others 1997, 134 and Spahr and others 1991). Actual occurrence is unknown. The mature/old Douglas-fir, Aspen, and mixed conifer forested habitat is at or near 100 percent.

Three-toed woodpecker (*Picoides tridactylus*) nests in snags. They feed on bark beetle larvae usually in subalpine fir habitat types (spruce-fir and lodgepole pine in a variety of successional stages). (Groves and others 1997 & Spahr and others 1991). Local population levels are reflective of conifer tree mortality. Bark beetle mortality is at levels to meet woodpeckers' needs. The

mature/old Douglas-fir, Aspen, and mixed conifer forested habitat is at or near 100 percent, and lodgepole pine is 58 percent.

Animal Damage Management is conducted by USDA APHIS Wildlife Services (WS). WS responds with effective, selective, and humane strategies to resolve wildlife conflicts. Idaho WS provides assistance in dealing with a diverse array of conflicts between people and wildlife. WS protects livestock, particularly sheep and calves, from predation by coyotes, wolves, black bears, mountain lions, and other predators. In addition, WS cooperates with State and Federal natural resource agencies in conducting studies to assess the potential impacts of predation on wildlife. WS' trained wildlife biologists and technicians assist farmers, ranchers, and other property owners with management of damage caused by marmots, beavers, and other rodents, and help dairy and feedlot owners reduce damage from large flocks of starlings and blackbirds. WS is also actively involved in managing problems caused by threatened or endangered species such as the gray wolf and grizzly bear. The program provides technical assistance to airports, which have concerns about wildlife collisions with airplanes, and works with aquaculture producers who request help to reduce predation by fish-eating birds. WS experts also provide technical assistance to grain farmers to reduce damage caused by waterfowl and sandhill cranes. (USDA APHIS WS Idaho 2006)

This Idaho Wildlife Services Program's (WS) Management Plan for the forest lands in the Caribou-Targhee National Forest, is updated yearly and covers the period of, October 1, to September 31. This plan is in concurrence with the Memorandum of Understanding (MOU) between the U.S. Department Agriculture, Forest Service (FS) and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) dated May 28, 2004.

This plan specifies where, when, and under what restrictions WS activities will be carried out. All activities will be conducted in accordance with the 2002 Environmental Assessment (EA) "Predator Damage Management in Southern Idaho" and the associated Finding of No Significant Impact (FONSI) and Decision Record signed April 16, 2002. That document incorporates by reference WS' 1996 EA, "Predator Damage Management in Southern Idaho" and the associated FONSI/Decision Record signed July 22, 1996, as well as WS' 1999 "Supplemental EA and Monitoring Report signed August 6, 1999.

The goal of the WS program on lands administered by the Caribou-Targhee National Forest is to minimize livestock and natural resource losses caused by predatory animals. Permittees that graze their livestock on National Forest lands historically sustain significant livestock loss, e.g., sheep, lambs and calves, to individual predators or local populations. Requests for assistance involving corrective and preventive control actions are received by WS to alleviate and prevent predation in problem areas.

WS provides a service only after a request for assistance has been received, when and where there is a demonstrated need, and after a careful review of available evidence. The service may be provided by two basic means: technical assistance and direct control. Technical assistance is the provision of advice, recommendations, information or materials for use in managing wildlife problems. Its emphasis is on helping others help themselves. Direct control is the implementation of control activities by wildlife damage specialists.

Until superseded by a new EA and/or a new Decision, Idaho WS activities will be conducted in accordance with the February, 2002 EA "Predator Damage Management in Southern Idaho", including all pertinent mitigation measures found in Chapter 3, pages 3-14 of that document. (USDA APHIS WS Idaho 2008)

Dead and Down Material, Snag / Cavity Nesting Habitat are an important structural component in forest communities. Logs and other woody debris, such as stumps, root wads, bark, and piles of limbs, occur on the floor of most forest ecosystems. These features provide diversity in the environment and are of varying significance as habitat for terrestrial wildlife (Thomas, 1979). Many wildlife species depend on dead trees for nesting, roosting, denning, foraging, resting or shelter. Snags are distributed singly, by death of individual trees, or in clusters, by weather, fire, insect or disease. Currently, pine beetle populations are at endemic levels across the Forest. Slash piles remaining after harvest can benefit some wildlife like rodents, hares, and rabbits.

Amphibians: Western boreal toad (*Bufo boreas*) and Northern leopard frog (*Rana pipiens*) are found in ponds, lakes, reservoirs, and slow-moving rivers and streams (Groves and others 1997, 6 & 11). Western boreal toad (*Bufo boreas*) were located in Lanes Creek off the forest during surveys conducted in 2003 by Idaho State University in conjunction with surveys in the Greater Yellowstone Ecosystem. Northern leopard frog (*Rana pipiens*) surveys of sites with historical sightings, in adjacent watersheds, have not found northern leopard frogs. Actual occurrence is unknown.

Big Game (elk & mule deer) & Winter Range – The majority of the watershed is in Elk Management Unit 76 south and east of Hwy 34 with a small portion of Unit 66A north of Hwy 34 east of Wayan and Unit 72 west of Hwy 34. Elk population levels are meeting or exceeding state objectives. The most recent aerial survey (2005) indicates that the population is above objectives for cows, bulls, and adult bulls (IDFG 2007d). Mule deer are above the threshold for unit 76. However, "mule deer populations are not what they used to be, throughout the West, or here in Idaho. That is why the Idaho Department of Fish and Game launched the Mule Deer Initiative in 2004. Fish and Game is committing more people and more resources to protect and improve habitat, increase mule deer numbers, manage predators, provide more hunter access, and keep the hunting public informed and involved." (IDFG 2008a) Spring, summer, and fall habitat is found the watershed. However, winter range (prescription areas 2.7.1 or 2.7.2 found in the watershed) is not expected to be occupied during severe winters. The two most significant winter ranges for mule deer in Unit 76 are outside the watershed (IDFG 2007d).

Landbirds use all habitat types and some migrate to central and south America for the winter. The **Migratory Bird Treaty Act if 1918** provides prohibitions regarding the "take" of migratory birds. **Executive Order 13186** (Clinton 2001) promotes the conservation of bird populations by restoring and enhancing habitat (or avoiding or minimizing adverse impacts or prevent detrimental alteration of bird habitat, to the extent practicable) for migratory birds. Idaho State Steering Committee (Intermountain West Joint Venture (IWJV) (2005) designated Riparian, Non-Riverine Wetlands, Aspen, and Sagebrush as "Priority A Habitats" for the conservation of birds. Priority B Habitats are: High Elevation Mixed Conifer (Spruce/Fir), Low Elevation Mixed Conifer (Douglas-fir), Juniper / Pinyon Pine / Mountain Mahogany, Mountain Brush / Shrubland, Cedar/Hemlock,

Grassland, & Agricultural. Priority C Habitats are Cliffs / rock outcrops / talus or Alpine and Lodgepole Pine

Idaho Sedge (*Carex idahoa* (sym:*Carex parryana* ssp. *idahoa*)) is found within the Upper Blackfoot watershed . Range-wide, it is rare to infrequent and very local. Habitat includes meadows, swales, and low, moist ground around streams and lakes, which tend to be areas where cattle congregate. Graminoids (grasses, sedges & rushes) are adapted to grazing and usually are able to persist with light to moderate grazing pressure. This suggests that Idaho Sedge would persist under light to moderate grazing but would decline with chronic heavy grazing (Lesica, 1998 *as referenced in USDA 2003a*). On Forest, the species is found in areas of active mining, which impacts a portion of the species metapopulation.

Beaver (*Castor canadensis*) – Blackfoot River and tributaries contain viable populations of beaver. Many beaver dam complexes exist in willow dominated riparian habitat. A decline in nearby aspen stands due to encroachment of conifer or past over-utilization by beaver may limit the long-term sustainability of these beaver populations.

American White Pelican (*Pelecanus erythrorhynchos*) and their nests are protected by the Migratory Bird Act as with all migratory birds. The pelican breeds in Canadian Prairie Provinces and parts of northwestern and Midwestern U.S., south to coastal Texas and winters along the Gulf and pacific coasts south to Guatemala. In Idaho, the pelican breeds at Minidoka NWR, Blackfoot Reservoir, and on the Snake River near Glenn's Ferry. (Groves et al. 1997). There were an estimated 1,900 nests at Minidoka and 1,700 nests at Blackfoot Reservoir in 2007 (IDFG 2007e). Pelicans are also seen at Palisades and Alexander Reservoir but the establishment of colonies at these locations is not known.

Designated Wildlife Areas

Idaho Birding Trails (IDFG 2006b) identified in the watershed are located in Diamond Creek, Blackfoot WMA, and Blackfoot Reservoir. In addition, the Blackfoot Reservoir has been identified as an **Important Bird Area** (IDFG 2006a). The **Diamond Creek Wildlife Viewing Area** was identified on the ground in 2007 by placing two Wildlife Viewing Areas signs on the north and south ends of the Diamond Creek road. **Blackfoot Wildlife Management Area (WMA)** operated by Idaho Department of Fish and Game is within the Diamond Creek Wildlife Viewing Area. The following is from the IDFG WMA web site (2007b):

Blackfoot WMA provides year-round habitat for moose. The aspen/conifer forested hills provide some winter habitat for elk, but most of the big game migrates to the Georgetown front, the 90 Percent Range, and possibly to Tex Creek WMA to the north. Due to snow depths, limited forage availability and thermal cover on the WMA, the area is not

considered big game winter range. Elk and mule deer frequently use the WMA in the spring, summer and fall.

Smaller mammal species are year long residents, including badger, striped skunk, weasel, snowshoe hare, chipmunk, porcupine, and coyote. The streams and waterways of the Blackfoot River WMA provide a home to beaver, muskrats, and mink.

Many species of waterfowl, including mallards, teal, gadwall, pintail, widgeon, and Canada geese nest and rear their young on the Blackfoot River WMA. Courtship displays of several pairs of sandhill cranes can be seen in the spring, along with shorebirds such as common snipe, willet, long-billed curlew, spotted sandpiper, sora, and killdeer. Forest areas provide food and shelter for blue grouse and ruffed grouse.

Yellow warbler, yellow-rumped warbler, MacGillivray's warbler, vesper sparrow, chipping sparrow, savannah sparrow, American goldfinch, lazuli bunting, western kingbird, evening grosbeak, yellow-bellied sapsucker, green-tailed towhee, Steller's jay, ruby-crowned kinglet, western meadowlark, and willow flycatcher are some of the birds that inhabit Blackfoot River WMA's forest, riparian, and upland habitat. Bald and golden eagles, Swainson's hawk, red-tailed hawk, rough-legged hawk, and northern harrier also frequent the area.

Fisheries The Blackfoot River historically provided one of the finest wild Yellowstone cutthroat trout fisheries in the nation. The construction of the Government Dam and Blackfoot Reservoir in the early 1900's provided optimum growing conditions for the resident cutthroat. The river was lightly fished through the 1940's, but when mining companies arrived in Soda Springs to mine and process phosphate ore, the community's growth led to a major increase in fishing pressure. Although fishing pressure increased markedly from 1951 to 1957, the quality of the fishery remained outstanding. It was too good to last. By 1975, opening day catch rates above the Slug Creek Bridge dropped to a low of 0.5 fish per hour. Cutthroat virtually disappeared from the fishery. Managers began supplementing with hatchery rainbow trout.

The cutthroat decline greatly concerned anglers and biologists. From 1978 to 1980, fisheries research biologists conducted an exhaustive study of the Blackfoot River fishery. From their work plus angler input, fisheries managers produced the Upper Blackfoot System Management Plan in 1990. The plan includes fishing regulations to encourage growth of the Yellowstone cutthroat trout population and seeks opportunities to improve trout habitat.

One of the primary missions of the WMA is to provide public access for hunting and fishing. The Blackfoot River continues to be a popular cutthroat trout fishery. With measures to restore the cutthroat trout fishery in place, we hope the wild trout fishery will again attain the quality thought to have existed only in the "good old days." The fishing season does not open until July 1 each year to allow for cutthroat trout spawning. Other special regulations apply so please consult current fishing regulations.

Blackfoot Reservoir Important Bird Area (*Identified)* – The habitat surrounding Blackfoot Reservoir is a mix of dryland grain fields and native sagebrush steppe with aspen pockets and basalt outcrops. The reservoir has several islands, covered mostly with native sagebrush habitat, but also with some willow riparian. Gull Island is used by nesting American White Pelicans, Double-crested Cormorants, California Gulls, and herons. The reservoir is storage for irrigation water, thus can experience low water by late summer. The reservoir is also important as a fishery for stocked rainbow trout and native Yellowstone cutthroat trout.

Gull Island, a 2.5 hectare island in Blackfoot Reservoir, supports the largest nesting colony (1400 nests in 2005) of American White Pelicans in Idaho. This island also supports one of the largest nesting colonies of Double-crested Cormorants (300+ nests) and California Gulls (6,000+ nests) in the state. An active Great Blue Heron, Black-crowned Night-heron, and Snowy Egret rookery can be found here as well. The reservoir itself is also used by waterfowl, waterbirds, and shorebirds during the summer, and possibly migration. (IDFG 2006a)

Health Advisory: Selenium in Elk Meat
In 2006, the Bureau of Community and Environmental Health (BCEH) (Agency for Toxic Substances and Disease Registry 2006) published an evaluation of contaminants associated with phosphate mining in southeast Idaho. Based on the environmental data reviewed, BCEH concluded that "It is unlikely that the contaminants in elk muscle and elk liver will result in any adverse health effects to those who eat 8 ounces of elk meat daily, or eat up to 10 ounces of elk liver per month." They recommended that "to be cautious, people should refer to Table 1 (reprinted below) to find out how much elk liver they can safely eat per month. BCEH's Public Health Action Plan included: 1)continuing to collaborate with Idaho Department of Environmental Quality (IDEQ) and the Selenium Area Wide Advisory Committee (SeAWAC) on activities at the site; 2)conducting community involvement and health education activities at the site, such as informing the hunters of the potential hazard scenario involving eating more than 10 ounces per month of elk liver; 3)reviewing environmental data as it pertains to public health when it becomes available, and; 4)working with and the Idaho Department of Fish and Game and the Idaho Bureau of Laboratories to analyze fish from the Resource Area for selenium and determine if fish advisories are warranted.

Table 1. Amount (oz) of Elk Liver That Can Be Safely Consumed per Month according to Body Weight

Body Weight Kg	**Kg**	15	25	35	45	55	65	75	85	95	105	115
Body Weight Lb	**Lb**	33	55	77	99	121	143	165	187	209	231	254
Amount of Elk Liver	**oz**	2	3.3	4.6	6	7.3	8.6	10	11.3	12.6	14	15.3

4.6 Human Uses

Minerals

The one aspect of the core topics and questions that is relevant from a minerals perspective beyond what is included in Chapter 1 is the Human Uses topic. This has two aspects that need further consideration: saleable minerals (mineral materials) and phosphate related activity. Because of the unknowns and uncertainty regarding potential future oil/gas development, it will not be discussed further in this section.

Phosphate Mining

Currently, there are three active phosphate mining operations within the Blackfoot River Watershed; the Dry Valley Mine Panels C and D, the North Rasmussen Ridge Mine, and the South Rasmussen Mine.

Other Saleable Minerals

There are three developed sources for gravel within or adjacent to the watershed (Randy Tate, personal communication, 2008). There may also be other very small, road cut sources that were used for gravel/fill materials present; these small sources will not be discussed here.

A partially backfilled pit at the abandoned Wolley Valley phosphate mine (located just below the Forest boundary) is currently being used by the County as a source of gravel. The County has set up a crusher at this site and it supplies surfacing material for the Blackfoot River and other roads in the area. The source of the material at this site is apparently the Wells Formation, generally a sandy limestone. The area was previously disturbed by phosphate mining, which exposed the Wells Fm. and made outcrops of the material available for development.

An outcrop of cherty material from the Phosphoria Fm. near the mouth of Timber Creek has also been used as a source of surfacing material. However, this material is located very close to the phosphate slurry line and is on an existing phosphate lease; future development at this site could possibly infringe on the rights of the lease holder. This source is not really available for further development at this time.

A source of rock for crushing has been developed near the Summit View campground, on the southern edge of the watershed. This source is in the Thaynes Fm., consisting mainly of limestone.

The phosphate mines located in the watershed use large amounts of mineral materials in the construction of roads and other facilities. These materials usually are generated within the mining operations from overburden waste rock. Since those sources are single use sources (for the mining companies) and are not available to the FS or other entities, they will not be discussed further in this section.

If new sources are needed in the watershed to accommodate future road related needs, those sources would need to be located, evaluated for suitability, and developed. Since that need is not apparent at this time, the possible locations for such use will not be evaluated in this assessment.

The Forest often receives requests from private individuals for permits to obtain rock for personal uses such as landscaping. If a source, near an existing road, with plentiful material of the size desired was found/developed, it could help supply that legitimate demand.

The disposal of mineral materials by the Forest Service is a totally discretionary activity, under authorities belonging to the Forest Service (36 CFR 228, subpart C). In this regard saleable minerals differ from leasable or locatable minerals, where the BLM is actively involved. Mineral

material development could be precluded in this watershed if the FS felt it was necessary for other resource reasons/concerns.

Transportation

(Also See Appendix B – Road Analysis)
Current transportation facilities (roads, bridges, and culverts) in the Upper Blackfoot Watershed provide important access for a variety of uses including recreation, ranching, timber harvest, and mining. The current system is very developed with a combination of planned and unplanned roads. The majority of the planned roads have been constructed for commercial access for grazing, timber, and mineral activities.

On the forest, the roads are categorized as arterial, collector and local. There is also a category of special use roads that provide access for the phosphate mines.

The arterial system is well developed and provides primary access to all of the major drainages with many of these primary access roads under county jurisdiction. These roads are generally graveled and receive annual maintenance. These roads include the Blackfoot River Road, Upper Valley Road, Chippy Creek Road, Diamond Creek Road, Timber Creek Road, Dry Valley Road, Trail Canyon Road, Wood Canyon Road, and Slug Creek Road. These roads provide access to and across the forest and also provide connectivity to public transportation routes outside of the watershed including State and Federal Highways and county roads.

There is also a well developed system of collector roads. These roads provide access to large areas and branch off of the primary arterial routes. Many of these roads are also graveled and receive annual maintenance. These roads include the Flat Valley Road, Diamond Bench Road, Dave's Creek Road, Rasmussen Valley Road, Harrington Peak Road and Big Basin Road.

There are numerous local roads many of which are native surfaced. Many of these roads evolved to support ranching activities. Additional roads were constructed for single purpose access for timber or mineral activities. Many of these roads are now used for recreational purposes especially during the hunting season. Some of these roads are managed as closed with several of these managed as motorized trails.

With the phosphate mining activity in the watershed there are also several special use haul roads, which are generally closed to the public. These roads can be up to 100 feet wide and have a graveled surface. These roads are associated with the Wooley Valley Mine, the Enoch Valley Mine, the Rasmussen Ridge Mines, the Dry Valley Mine, the Mountain Fuel Mine, the Champ and the Maybe Canyon Mines. In additional, there are many temporary local roads within the mine development including local haul roads.

As part of the 2007 revised forest travel planning effort, the forest transportation inventory was updated. Using digital orthoquads, an improved GIS layer of all existing system and non-system roads was developed. The 2007 Revised Travel Plan Roads Analysis analyzed each of these roads assessing the environmental impacts versus the transportation needs and made recommendations

on their management. Based on the decisions of the Revised Travel Plan, there are approximately 286 miles of system roads within the watershed and within the forest boundary. These roads can be broken down as follows:

178 miles of roads open for public use
- 0.3 miles paved state highways
- 18.8 miles of aggregate county roads
- 36.1 miles of FS aggregate roads maintained for passenger cars
- 123.0 miles of FS native surfaced roads managed for high clearance vehicles

108 miles of FS roads closed to public use with full sized vehicles
- 44.7 miles managed as closed to all vehicles
- 51.5 managed as motorized trails
- 11.8 miles managed as special use mining haul roads

There are additional miles of roads within the forest boundary that are not managed as system roads. These include user created roads and decommissioned temporary timber and mineral access roads. Most of these roads were captured in the updated GIS coverage and evaluated during the revised travel planning roads analysis. Management recommendations were made for these roads and final decisions were made in the Revised Travel Plan FEIS. If appropriate, road closures and methods of closure were identified in the final plan. These roads are not inventoried as system roads and therefore not included in the miles above.

The Caribou-Targhee National Forest contains several areas that are designated as "Idaho Roadless Areas" under the Idaho Roadless Rule. The Idaho Roadless Rule was published in the Federal Register on October 16, 2008 and is the current direction for management of these designated Idaho Roadless Areas (Map 7 Appendix A).

The Idaho Roadless Rule established five management themes for the individual roadless areas.

The five themes are as follows;

- Wild Land Recreation
- Special Areas of Historic or Tribal Significance
- Primitive
- Backcountry/Restoration
- General Forest, Rangeland and Grassland

These themes provide prohibitions and limited permissions for the following:

- Road construction and reconstruction
- Timber cutting, sale or removal
- Discretionary mineral activities

For further information regarding the Idaho Roadless Rule and the management themes and the associated prohibitions and limited permissions in those themes you can go to the following website http://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5053191.pdf .

Range management

Currently there are 14 sheep allotments and three cattle allotments on Forest Service administered land within the Upper Blackfoot Watershed. Several of the sheep allotments encompass acreage within other watersheds other than the Blackfoot. The following table displays the numbers and kind of livestock currently grazing on Forest Service land within the Upper Blackfoot Watershed, and the approximate percentage of the grazing time spent within the Upper Blackfoot Watershed

Livestock Grazing Within the Upper Blackfoot Watershed

Allotment	Livestock Type	Livestock Number	Season of Use	In more than Blackfoot WS	Approx % time in Blackfoot WS
Henry Olsen	Sheep	1,000	6/16-9/5	No	100%
Kendall Can.	Sheep	1,050	6/25-9/15	No	100%
Mabey Can.	Sheep	1,000	6/21-9/15	No	100%
N. Sulphur	Sheep	1,050	6/16-9/5	Yes	20%
Johnson Cr.	Sheep	1,050	6/16-9/5	No	100%
S. Sulphur	Sheep	800	6/16-8/31	Yes	20%
Slug Cr.	Sheep	1,100	6/18-9/20	No	100%
Timber Cr.	Sheep	1,000	7/1-8/30	Yes	60%
Sage Cr.	Sheep	1,000	7/1-8/30	Yes	30%
Pole/Draney	Sheep	1,020	6/27-9/20	Yes	20%
Bear Can.	Sheep	975	7/1-8/30	No	100%
Yellowjacket	Sheep	975	7/1-8/30	Yes	25%
Lower Bacon	Sheep	1,100	6/21-9/15	Yes	75%
Diamond/Boulder	Sheep	1,200	7/1-9/10	Yes	40%
	Total Sheep	**14,320**			
Rasmussen Valley	Cattle	378	6/11-9/30	No	100%
Dry Valley	Cattle	1,504	6/6-9/20	No	100%
Diamond Cr.	Cattle	280	6/11-10/10	No	100%
	Total Cattle	**2,162**			

Several of the allotments are within two different watersheds. When numbers are calculated using only the acres within the Upper Blackfoot Watershed, the sheep numbers above would be reduced. Permitted sheep within the watershed would be approximately 9,200 and the cattle numbers would remain at 2162.

Allotment Improvements

Allotment	Ponds	Water Troughs	Fences	Corrals	In Blackfoot WS
Henry Olsen	11	1			Yes
Kendall Can.	9	1			Yes
Mabey Can.	3	3			Yes
N. Sulphur	4	2			1 pond
Johnson Cr.	9	2			Yes
S. Sulphur	7	1			No
Slug Cr.	8	2		1	Yes
Timber Cr.	No Improvements				
Sage Cr.	8	2			1 Trough
Pole/Draney		5		1	No
Bear Can.		3			Yes
Yellowjacket	4	2		1	Yes
Lower Bacon	2			1	Yes
Diamond/Boulder		4			1 pond
Rasmussen Valley	29		Many		Yes
Dry Valley	40	17	Many		Yes
Diamond Cr.	5		Many		Yes

Recreation

Camping

The analysis area has two campgrounds and numerous dispersed camping opportunities. The Mill Creek Campground is small with only 10 camp sites and is located in the Blackfoot narrows along the lower stretch of Mill Creek. The Diamond Creek Campground was at one time the CCC camp for the area and still has the foundation of the old building. Beetles wiped out the remaining live lodgepole pine trees on the north side in 2003. Currently the campground has only a few poorly designated sites that provide shade and an inadequate one seat outhouse.

For a number of years long term dispersed camping was tolerated on the Soda Springs District and was not a problem until the mid 1990's when hunting success began to popularize the area for the quality and abundance of big game. Gradually camping increased and began to saturate places like Diamond Creek during holiday weekends and hunting season from 1999 to present. During the 2005 hunting season, long term camping permits were issued to 37 individuals. Each individual permit ranged from 4-14 trailers totaling 116 individual camping trailers across the District with all but 6 of the issued camping permits within the analysis area. The figures do not account for the hundreds of other campers who did not seek a permit (see long term camping permits D-55, 2005).

Dispersed camping sites are very common along the open valley floor in Diamond Creek and tend to fill with multiple trailers in circle formation on the same site. Some dispersed sites have been documented with as many as 14 trailers at one time. Other locations in the analysis area such as Slug Creek, Trail Canyon, Wood Canyon, Johnson Creek and Diamond Flat are popular as well. The majority of campers come from the surrounding counties to enjoy weekend stays on the Forest and ride ATV's. During the start of big game hunting season demographics change generally it is difficult to find camping spots during weekends from August to the end of October. The trend for dispersed camping has increased. At last count the analysis area had **81** well used dispersed camping locations, most of them in Diamond Creek.

Snowmobiling
Diamond Creek has large open valley bottoms for intermediate snowmobile touring and a warming hut near the Diamond Creek Campground. The Johnson Creek guard Station is a Forest Service facility that can be rented for overnight use, while the warming hut is free for day use only and is maintained by a snowmobile club from Soda Springs. The Diamond Creek is intermittently groomed from the Blackfoot narrows to the mouth of Georgetown Canyon.
The looped groomed trail system from Trail Canyon to Slug Creek area provides access for intermediate to challenging off trail riding for experienced snowmobilers who enjoy un-groomed terrain. The parking area in Trail Canyon also has a warming hut with a wood burning stove and tables for day use.

Hunting
Big game hunting is popular during the fall months with hunters on horseback in the non motorized areas and motorized hunting on designated routes within Idaho Fish and Game unit 76. Hunting begins in late August with archery season and generally ends in mid November following the cow elk rifle hunt. The area has one Outfitter and Guide.

Non-Motorized travel
The analysis area has about 22 miles of non-motorized trails that are primarily used by livestock operators during the grazing season. Horseback riding, mountain biking and hiking occur in incidental amounts with the exception of big game hunting on foot and horseback during the fall season. Use has declined with the advent of ATV's.

Special Use Permits
The analysis area has 2 special use permits for recreational facilities and one permit for outfitting & guiding. Diamond Creek has an A-frame warming shelter on the north side of the Diamond Creek Campground for winter time day use. The site is maintained by the Caribou Trail Riders and is not always in the best of repair. Use for the site is unknown. The archery range is under special use permit to the Caribou Field Archers and is maintained by the club. The road that accesses the range is in poor shape and parking is limited during competitions that are held 1 or 2 times over the summer. The trees in and around the range have matured thus suffering mortality from beetle attack and blow down from weather events. Inquires for special uses is ongoing.

All Terrain Vehicles

Riding off road motor vehicles is the most popular summer/winter recreation activity in the analysis area. The majority of the routes are secondary high clearance vehicle roads, closed to full size vehicle but open to ATV's. Recreation use can exceed capacity on weekends, holidays and the opening day of hunting seasons causing problems for safety and resource damage. Construction of designated ATV trails for the purpose of recreation began on the District in about 1994 when users were coming to Forest creating unauthorized trails. After completion of the Travel Management Plan in 2005 user created trails have declined with user days remaining steady since about 2002. Education, signing and physical closures have also returned positive results. During the public process of scoping and generating alternatives for the Travel Management Plan a number user created trails were considered for the preferred alternative. Trails that could be feasibly realigned with minor construction were accepted as part of the new plan. Trail Creek, Wood Canyon and Johnson Creek have a number of user created trails that were accepted as part of the Travel Management Plan that have never been maintained.

Analysis area motorized trails 50 inches or less.

	Open Trails	**Closed Trails**
Miles	94	25