Panels F and G are located in the Webster and Preuss Ranges, and the average annual runoff in these ranges is estimated at 1.07 acre-feet of water per acre of land (USDA 1990). This rate of runoff is more than twice the average runoff of the Blackfoot River watershed, slightly higher than the average for the Salt River, and more than seven times the average annual runoff of the Bear River at Soda Springs, Idaho. Runoff rate statistics indicate that this area is in an important water source area for all three drainages (USDA 1990).

The annual water losses through evaporation exceed the annual water gains from precipitation at lower elevations and in the western portion of the Forest (USDA 1990). Vegetation distribution is controlled mostly by altitude, latitude, direction of prevailing winds, and slope exposure.

Existing soils in the Study Area are largely undisturbed. Past mineral exploration and timber harvesting have disturbed parts of the area. All these areas have been reclaimed and the soil stabilized with vegetation. Forest Routes open to motorized access in the area present an ongoing ground disturbance. Soils in the area can also be affected by grazing and recreational activities (USFS 2003b).

3.4.1 Soil Survey

The Baseline Technical Report for Soil Resources (Maxim 2004f) is a 2nd Order soil inventory conducted from June through August 2003 and is the main reference for determining onsite soil characteristics. Procedures and interpretations were adapted primarily from the *Soil Survey Manual* (USDA 1993), *National Soil Survey Handbook* (USDA 2003b), and *Keys to Soil Taxonomy* (USDA 2003c). Soil resources outside the 2nd Order soil inventory area have been evaluated at the 3rd Order level using the *Soil Survey of the Caribou National Forest, Idaho (*USDA 1990) and the *Soil Survey of Star Valley Area, Wyoming-Idaho* (USDA 1976).

Twenty-two soil map units were identified and mapped, including seven consociations and 15 complexes (Maxim 2004f). Soil profile characteristics obtained in the field were utilized in coordination with laboratory analyses to determine suitable depths of salvage for each soil type. Field procedures and detailed data from the 2nd Order soil inventory are presented in the baseline technical report (Maxim 2004f).

A reconnaissance level field survey was conducted on natural soils within the portions of the proposed and alternative haul road and conveyor corridors, based on the existing 3rd Order *Soil Survey of the Caribou National Forest, Idaho* (USDA 1990). The field survey review included evaluation of exposed soil profiles, depths, coarse fragment content, color, and vegetation-soil relationships, and concluded that soil resources within these proposed disturbance areas have been accurately characterized in the existing survey (Maxim 2004f).

3.4.2 Mapped Soil Unit Characteristics

Soil map units determined in the baseline technical report (Maxim 2004f) for proposed disturbance in Panel F and Panel G are shown on **Figure 3.4-1** and **Figure 3.4-2**, respectively. Soil resources for the proposed haul road, conveyor corridors, and alternatives are shown at a 3rd Order level on **Figure 3.4-3**.

Figure 3.4-1 Soil Mapping Units of Panel F

Figure 3.4-2 Soil Mapping Units of Panel G

Figure 3.4-3 Order 3 General Soils of Transportation Area

Profile descriptions, laboratory analysis results, and complete soil map unit data for each sample site are presented in the baseline report. **Table 3.4-1** provides a summary of the soil map units, identifying the classification, properties, and characteristics of the soils, and their total composition within the Project Area. Soils in the baseline Study Area are classified to the soil family level in accordance with *Keys to Soil Taxonomy* (USDA 2003c).

The majority of soils in the Project Area are classified as moderately deep to very deep, well drained to somewhat excessively well drained, loamy-skeletal or fine-loamy, mixed, superactive, Xeric Argicryolls, Haplocryolls, and Haplocryalfs. Soil textures are generally loamy with a high percentage of coarse fragments. Slope steepness ranges from 5 to 75 percent and varies depending on the profile location. Laboratory analytical data indicate that soils pH values range from 5.1 to 8.2 (strongly acid to moderately alkaline), but the majority of soils are neutral to moderately acid. Soil organic matter content ranges from 0.48 to 10.5 percent, with an average of between 1 and 3 percent organic matter. Soil depths in the Project Area ranged from rock outcrop areas with no measurable soil to profiles greater than five feet thick.

The map units are mapped as land types and cover a wide range of topography from valley and drainage bottoms to canyon slopes, sideslopes, and ridgetops. Soils found in the Project Area are classified taxonomically as Argicryolls, Cryorthents, Eutrocryepts, Haplocryolls, and Haplocryalfs.

Parent materials for soils within the Project Area include sandstone, shale, siltstone, limestone, chert, colluvium, alluvium, and residuum (Maxim 2004f). Soil in drainages and swales developed primarily from alluvial materials, and colluvium is the parent material for development of soil on most slopes.

Depth to water table was determined to be greater than six feet for all map units in the Project Area (Maxim 2004f).

Seven soil consociations and 15 soil complexes were identified as map units within the Project Area. Rock outcrops are not suitable for recovery and use as growth medium. Maxim (2004f) provides further details regarding the specific soil characteristics for each of the individual sample sites. The soil complexes and consociations identified within the Project Area are shown on **Figures 3.4-1** and **3.4-2**.

Soil inclusions that exist to a limited extent within the composition of the soil complexes and consociations identified in the 2nd Order inventory area, but are not a significant portion of the map unit, include the following soil types: Cluff, Mikesell, Moonlight, Nisula, Povey, Redfeather, Starley, Starman, and Thayne. Maxim (2004f) provides further details regarding soil characteristics for these inclusion soil types.

Soil map units described at the 3rd Order level that have been identified in the vicinity of the Study Area are shown on **Figure 3.4-3**. These mapping units are further described in the *Soil Survey of the Caribou National Forest, Idaho* (USDA 1990).

TABLE 3.4-1 SOIL MAP UNIT DESCRIPTIONS

MAP UNIT NUMBER[1]/ NAME	TAXONOMIC CLASSIFICATION	PERCENTAGE OF MAP UNIT	LANDSCAPE POSITION/ SLOPE	PARENT MATERIAL	TEXTURE	APPROXIMATE SOIL DEPTH (INCHES)	ERODIBILITY WIND WATER	PERCENT COARSE FRAGMENTS	WATER HOLDING CAPACITY
1/ Ericson-Rock River Complex	Fine-loamy, mixed, superactive Xeric Haplocryalf	50	Valley bottom/ 15-22%	Alluvium and colluvium	Loam	28	Moderate Moderate	20	Moderate
	Rock River	35			Rock outcrop	0	Low Moderate	+90	Low
2/ Ketchum Loam	Loamy-skeletal, mixed, superactive Xeric Eutrocryept	80	Ridgetop and canyon slopes/ 7–40 %	Limestone	Loam	24	Low Moderate	40	Low-Moderate
3/ Cloud Peak-Ketchum Complex	Loamy-skeletal, mixed, superactive Inceptic Haplocryalf	40	Steep slopes/ 45-55%	Shale and chert	Loam	24	Low Moderate	40	Very High
	Loamy-skeletal, mixed, superactive Xeric Eutrocryept	40							
4/ Dranyon-Fluvents/Aquolls Complex	Fine-loamy, mixed, superactive Pachic Argicryoll	50	Drainage bottoms and side slopes/ 5-15%	Alluvium	Loam	30	Moderate Moderate	15	Moderate-High
		30							
5/ Blaine-Farlow Complex	Loamy-skeletal, mixed, superactive Xeric Argicryoll	45	Ridgetop and steep side slopes/ 15-50%	Chert, limestone, siltstone	Loam	24	Moderate Moderate	35-60	Moderate-High
	Loamy-skeletal, mixed, superactive Xeric Haplocryoll	40				18			
6/ Ericson-Blaine Complex	Fine-loamy, mixed, superactive Xeric Haplocryalf	50	Hilltops and side slopes/ 15-40%	Old limestone, alluvium and colluvium	Sandy loam	24	Moderate Moderate	40	Moderate-High
	Loamy-skeletal, mixed, superactive Xeric Argicryoll	35	Hilltops and side slopes/ 15-50%					20	
7/ Dranyon-Parkay Complex	Fine-loamy, mixed, superactive Pachic Argicryoll	40	Drainage bottoms and side slopes/ 5-30%	Alluvium and colluvium	Silt loam	30	Moderate High	30	High-Very High
	Loamy-skeletal, mixed, superactive Pachic Argicryoll	40						35	

MAP UNIT NUMBER[1]/ NAME	TAXONOMIC CLASSIFICATION	PERCENTAGE OF MAP UNIT	LANDSCAPE POSITION/ SLOPE	PARENT MATERIAL	TEXTURE	APPROXIMATE SOIL DEPTH (INCHES)	ERODIBILITY WIND WATER	PERCENT COARSE FRAGMENTS	WATER HOLDING CAPACITY
8/ Farlow-Ketchum Complex	Loamy-skeletal, mixed, superactive Xeric Haplocryoll	50	Ridgetop and steep side slopes/ 20-50%	Cherty shale and Rex Chert, mixed colluvium	Sandy loam	18	Low Moderate	40	Low
	Loamy-skeletal, mixed, superactive Xeric Eutrocryept	35						50	
9/ Swede-Blaine Complex	Fine-loamy, mixed, superactive Xeric Argicryoll	45	Gentle slopes and swales/ 10-15%	Alluvium and colluvium limestone derived	Loam	36	Moderate Moderate	35	Moderate
	Loamy-skeletal, mixed, superactive Xeric Argicryoll	40						20	
10/ Ericson Loam	Fine-loamy, mixed, superactive Xeric Haplocryalf	80	Hilltops and side slopes/ 10-20%	Shale and sandstone	Loam	20	Moderate Moderate	20	High
13/ Blaine-Dranyon Complex	Loamy-skeletal, mixed, superactive Xeric Argicryoll	60	Steep south facing slopes and benches/ 10-20%	Shale and limestone derived colluvium	Silt loam	24	Moderate Moderate	40	Very High
	Fine-loamy, mixed, superactive Pachic Argicryoll	25				30		20	
14/ Blaine-Jughandle Complex	Loamy-skeletal, mixed, superactive Xeric Argicryoll	60	Ridgetops and steep slopes/ 35-45%	Limestone colluvium	Loam	24	Moderate Moderate	40	Moderate
	Coarse-loamy, mixed, superactive Xeric Eutrocryept	25				18		20	
16/ Cloud Peak Loam	Loamy-skeletal, mixed, superactive Inceptic Haplocryalf	70	Swales and gentle side slopes/ 10-15%	Limestone residuum and colluvium	Loam	24	Moderate Moderate	40	Moderate
17/ Farlow-Blaine Complex	Loamy-skeletal, mixed, superactive Xeric Haplocryoll	65	Steep canyon side slopes/ 40-55%	Limestone colluvium	Silt loam	18	Moderate Moderate	45	Moderate-High
	Loamy-skeletal, mixed, superactive Xeric Argicryoll	20				24		40	
18/ Starman-Rock Outcrop Complex	Loamy-skeletal, mixed, superactive Lithic Cryorthent	40	Ridgetops and steep slopes/ 20-75%	Chert and limestone residuum	Loam	6	Low Moderate	50+	Very Low
	Rock Outcrop	40			Rock outcrop	0		90+	

MAP UNIT NUMBER[1]/ NAME	TAXONOMIC CLASSIFICATION	PERCENTAGE OF MAP UNIT	LANDSCAPE POSITION/ SLOPE	PARENT MATERIAL	TEXTURE	APPROXIMATE SOIL DEPTH (INCHES)	ERODIBILITY WIND WATER	PERCENT COARSE FRAGMENTS	WATER HOLDING CAPACITY
19/ Judkins-Blaine Complex	Loamy-skeletal, mixed, superactive Xerollic Haplocryalf	45	Mountain side slopes, north aspect/ 25-50%	Cherty shale and Rex Chert, mixed colluvium	Gravelly loam	24	Moderate Moderate	50	Moderate
	Loamy-skeletal, mixed, superactive Xeric Argicryoll	40							
20/ Karlan-Dranyon Complex	Fine-loamy, mixed, superactive Pachic Haplocryoll	50	Mountain side slopes, south and west aspects/ 35-50%	Siltstone and shale	Silt loam	30	Low Moderate	10	Very High
	Fine-loamy, mixed, superactive Pachic Argicryoll	30							
21/ Dranyon-Ericson Complex	Fine-loamy, mixed, superactive Pachic Argicryoll	60	Valley bottom and swale/ 5-10%	Alluvium	Sandy loam	24	Moderate Moderate	25	High- Very High
	Fine-loamy, mixed, superactive Xeric Haplocryalf	20							
22/ Judkins Silt Loams	Loamy-skeletal, mixed, superactive Xerollic Haplocryalf	75	Ridgetop and side slopes/ 15-30%	Dolomite, limestone, shale	Silt loam	24	Moderate Moderate	70	Moderate
24/ Cloud Peak Silt Loams	Loamy-skeletal, mixed, superactive Inceptic Haplocryalf	75	Side slopes and ridge crests/ 20-30%	Shale and chert colluvium and residuum	Silt loam	24	Moderate Moderate	50	Moderate
25/ Jughandle Silt Loams	Coarse-loamy, mixed, superactive Xeric Eutrocryept	75	Steep side slopes/ 40-50%	Sandstone, limestone	Silt loam	24	Moderate Moderate	15	Moderate
26/ Starley Silt Loams	Loamy-skeletal, mixed, superactive Lithic Haplocryoll	90	Ridge crest/ 10-50%	Limestone, dolomite	Silt loam	6	Low Moderate	50	Very Low

Source: Maxim 2004f
[1] Map units are identified on **Figures 3.4-1** and **3.4-2**.

3.4.3 Topsoil/Growth Medium Suitability

Mountainous terrain does not favor optimal soil development. Soils on mountain slopes are susceptible to increased erosion rates that constantly remove the fine particles from the surface and deposit them on the surfaces of soils occupying the alluvial or valley slopes. Mountain soils also tend to have high concentrations of coarse fragments that are transported to the alluvial slopes during landslide events over time. Shallow, stony soils provide a minimal amount of quality topsoil/growth medium material for reclamation. The rate of soil formation is slow in any environmental condition and location, even beneath grassland vegetation. Rates of soil formation from consolidated parent material under grasslands have been calculated at 0.33 tons per acre per year or less (DeBano and Wood 1992).

The estimated average depth of topsoil currently existing in the Project Area is more than 22 inches, as described in the baseline report (Maxim 2004f). Steep slopes are the main limitation that would preclude salvage of topsoil resources in disturbance areas. An estimated 12 acres of soil resources would not be suitable for recovery as growth medium for reclamation due to limiting factors such as rock outcrop, excessive coarse fragments, or slope. These areas of unrecoverable soil are scattered throughout the Project Area.

The suitable topsoil/growth medium depths determined for each soil type were based on the amount of salvageable unconsolidated material available in the surface soil or within the subsoil. The percentage of coarse fragments, organic matter, and selenium concentrations were additional, locally important limitations considered in determining topsoil/growth medium suitability. Criteria utilized by Maxim (2004f) to initially determine topsoil/growth medium suitability were developed and outlined by CNF resource specialists and are detailed in **Table 3.4-2**.

TABLE 3.4-2 CRITERIA USED TO DETERMINE TOPSOIL/GROWTH MEDIUM SUITABILITY

PROPERTY	TOPSOIL/GROWTH MEDIUM SUITABILITY				RESTRICTIVE FEATURE[1]
	GOOD	FAIR	POOR	UNSUITABLE	
Texture	textures finer than sands and coarser than sandy clay and silty clay, with less than 35% clay	loamy textures	sand textures and clayey textures with <60% clay	>60% clay content	excessive sands or clays
Organic Matter Content	>3%	<3% but greater than 1%[1]	0.5 to 1.0%[1]	<0.5%[1]	low fertility
Coarse Fragments (0-40 inches)	<15% by volume	15-25% by volume	25-35% by volume	>35%	equipment restrictions and low fertility
Depth to High Water Table	--	--	<1 foot to high water	perennial wetness	equipment restrictions
Soil Reaction – pH[2] (0-40 inches)	6.0 to 8.0	5.0 to 6.0 8.0 to 8.5	4.5 to 5.0 8.5 to 9.0	<4.5 or >9.0	excessive acidity or alkalinity
Slope Steepness	<8% slope	8 to 25% slope	25 to 40% slope	>40% slope	equipment restrictions

Source: Maxim 2004f
Notes:
1. As defined in the Soil Survey Manual (USDA 1993) and National Soil Survey Handbook (USDA 2003b).
2. pH in standard units.
< Less than
> Greater than

Based on field reviews of the soils mapped in the Project Area, the majority of soil family classifications were determined to be potentially suitable for topsoil or growth medium recovery. Samples of each soil horizon were collected and submitted for laboratory analysis to further determine the characteristics and limitations for each soil type. **Table 3.4-3** identifies the topsoil/growth medium suitability parameters and limitations for each soil family that comprise the 2nd Order map units found within the Project Area.

Table 3.4-4 identifies the extent of suitable and marginally suitable soils for topsoil/growth medium salvage found within mapped soil units covered by the 2nd Order soil inventory, including the total volume of useable topsoil/growth medium. The reclamation potential for soils recoverable within the Project Area is based on production and fertility parameters identified in **Table 3.4-2** such as soil texture, organic matter, slope steepness, coarse fragment content, and pH. Soils in the Project Area have pH values of 5.1 to 8.2 that fall within the suitability limit range (Maxim 2004f). Individual soil sample sites may not be representative of the surrounding soil in the major map unit. These minor inclusions represent a small percentage of the map unit and would be incorporated into the majority soil during salvage and reclamation. Excessive coarse fragment content and steep slopes are the two limitations that have the most potential to negatively influence fertility and production of reclaimed areas within the Project Area. Mixing of soil map units during salvage operations would dilute excessive coarse fragment content and selenium concentration in some soils, resulting in maximum recovery volumes.

Prime Farmland

Prime farmland is classified as available land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops (USDA 1993). Due to high elevations, there are no prime farmlands located within Caribou County. The growing season in areas of high elevation in this portion of southeastern Idaho often is less than 60 days and frost may occur anytime during the year at elevations above 6,500 feet (USDA 1990), which renders the soil unsuitable for classification as prime farmland.

Existing Disturbance

Approximately 745 acres of soil resources within the Project Area have been previously disturbed, including 517 acres of disturbance due to timber harvesting, 152 acres of mining and mineral exploration disturbance, and 76 acres of roads and trails. Disturbances in the surrounding area include livestock grazing, fire, and utility corridors.

TABLE 3.4-3 TOPSOIL/GROWTH MEDIUM SUITABILITY PARAMETERS FOR SOILS IN THE PROJECT AREA

SOIL FAMILY	PHYSICAL CONSIDERATIONS			ANALYTICAL CONSIDERATIONS[3]				TOPSOIL/ GROWTH MEDIUM SUITABILITY LIMITATION(S) [5]
	SOIL TEXTURE[1]	COARSE FRAGMENT CONTENT PERCENT [2]	SLOPE PERCENT	ORGANIC MATTER PERCENT[4]	REACTION (PH) [4]	TOTAL SELENIUM[4] (SE)	EXTRACTABLE SELENIUM[4] (SE) (MG/KG)	
Blaine	Silty clay loam/ Clay loam	35-60	10-70	2.59-10.2	5.9-6.0	Not Detected (ND)	0.09-0.15	Extractable Se greater than 0.10 mg/Kg[6]. Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Cloud Peak	Sandy loam/ Silt loam/ Loam	40-50	15-60	0.48-3.5	5.0-7.6	ND	ND to 0.13	Extractable Se greater than 0.10 mg/Kg[7]. Low organic matter content below 39 inches. Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Ericson	Loam/ Silt loam/ Clay loam	20-25	2-60	0.52-3.38	5.4-6.6	ND	ND to 0.26	Extractable Se greater than 0.10 mg/Kg[6]. Equipment restrictions in areas with >40% slope.
Farlow	Silt loam	35-60	0-70	1.22-6.71	5.5-7.1	ND	ND to 0.10	Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Judkins	Loam	50-70	2-65	0.88-10.5	6.3-7.3	ND to 6 mg/Kg	ND to 0.14	Extractable Se greater than 0.10 mg/Kg[6]. Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Jughandle	Silt loam/ Loam/ Sandy loam	15-20	30-50	0.47-6.09	5.1-6.6	ND	ND to 0.07	Low organic matter content below 17 inches. Equipment restrictions in areas with >40% slope.
Jughandle (variant)	Silty clay loam	15-20	30-50	1.67-4.07	5.8-6.0	ND	0.11-0.12	Extractable Se greater than 0.10 mg/Kg[6]. Equipment restrictions in areas with >40% slope.

SOIL FAMILY	PHYSICAL CONSIDERATIONS			ANALYTICAL CONSIDERATIONS[3]				TOPSOIL/ GROWTH MEDIUM SUITABILITY LIMITATION(S) [5]
	SOIL TEXTURE[1]	COARSE FRAGMENT CONTENT PERCENT [2]	SLOPE PERCENT	ORGANIC MATTER PERCENT[4]	REACTION (PH) [4]	TOTAL SELENIUM[4] (SE)	EXTRACTABLE SELENIUM[4] (SE) (MG/KG)	
Karlan	Loam/ Silt loam/ Silty clay loam	10-15	10-60	0.71-4.93	5.6-8.2	ND to 24 mg/Kg	0.03-0.14[7]	Total Se greater than 13 mg/Kg[6] and extractable Se greater than 0.10 mg/Kg[7]. Equipment restrictions in areas with >40% slope.
Ketchum	Sandy loam/ Silt loam/ Loam/ Silty clay loam	40-50	10-70	0.33-5.26	5.3-7.4	ND to 8 mg/Kg	ND to 0.06	Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Moonlight	Loam	Not Applicable (NA)	15-35	0.69-3.88	5.7-6.0	ND	ND to 0.07	NA
Parkay	Silt loam	35	10-70	1.31-5.26	6.4-7.1	ND	0.07-0.10	Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Povey	Loam	NA	0-60	2.45-4.9	6.9-7.4	ND	ND to 0.08	Equipment restrictions in areas with >40% slope.
Starley	Silt loam	50	10-70	NA	6.3-7.2	Not Analyzed	Not Analyzed	Equipment restrictions in areas with >40% slope. Equipment restrictions and low fertility in areas with high coarse fragment content.
Starman	Silt loam/ Loam	+50	15-70	0.88-7.02	5.8-6.0	ND	0.04	Equipment restrictions and low fertility in areas with high coarse fragment content. Equipment restrictions in areas with >40% slope.
Swede	Silt loam/ Silty clay loam	20	5-65	0.78-8.48	5.5-6.3	ND	0.07-0.14	Extractable Se greater than 0.10 mg/Kg[7]. Equipment restrictions in areas with >40% slope.

Source: Maxim 2004f

1. Majority soil texture(s) (by percent weight) occurring throughout the depth of the profile.
2. Range of estimated percent volume of coarse material through the top 40 inches of the profile. Coarse fragment content is dominated by gravels in most soils.
3. Production potential.
4. Range of values through soil profile. The pH values represent the top 40 inches of the soil profile.
5. Based, in part, on Guidelines for the Salvage of Topsoil and Shale used to Reclaim and Provide a Seed Bed for Phosphate Mine Reclamation (USDA 2003a), in addition to suitability parameters identified in **Table 3.4-2**.
6. At one sample site.
7. At more than one sample site.

ND = Not detected.

TABLE 3.4-4 SUITABLE AND MARGINALLY SUITABLE RECLAMATION SOILS IN THE PANEL F AND G PROJECT AREA

MAP UNIT[1]	SOIL FAMILY	SUITABLE TOPSOIL/GROWTH MEDIUM		MARGINALLY SUITABLE TOPSOIL/GROWTH MEDIUM		ACRES WITHIN PANELS F & G (INCLUDES PROPOSED LEASE MODIFICATIONS)	TOPSOIL/GROWTH MEDIUM VOLUME (BCY)
		SOIL DEPTH (INCHES)[2]	CONSTRAINTS	SOIL DEPTH (INCHES)[2] AND HORIZON DEPTHS	CONSTRAINTS		
1/ Ericson-Rock River Complex	Ericson	15	--	11 (15-26)	Selenium[4]	5.86*	12,309
	Rock River	0	Rock outcrop	0	Rock outcrop		
2/ Ketchum Loam	Ketchum	22	Slope[3]	44 (22-66+)	Excessive coarse fragment content	1.0	8,906
3/ Cloud Peak-Ketchum Complex	Cloud Peak	5	Excessive coarse fragment content or slope[3]	58 (5-55+)	Excessive coarse fragment content or selenium[4]	8.87	75,129
	Ketchum						
4/ Dranyon-Fluvents/Aquolls Complex	Dranyon[5]	30	--	0	--	1.68	6,776
	Fluvents/ Aquolls						
5/ Blaine-Farlow Complex	Blaine	0	Excessive coarse fragment content or slope[3]	21 (0-21+)	Excessive coarse fragment content or slope[3]	85.56	241,564
	Farlow						
6/ Ericson-Blaine Complex	Ericson	0	Selenium[4]	24 (0-24)	Excessive coarse fragment content, selenium[4] or slope[3]	45.21	145,878
	Blaine	0	Excessive coarse fragment content				
7/ Dranyon-Parkay Complex	Dranyon[5]	16	--	13 (16-29)	Selenium[4]	17.42	67,731
	Parkay						
8/ Farlow-Ketchum Complex	Farlow	0	Excessive coarse fragment content or slope[3]	18 (0-18)	Excessive coarse fragment content	84.3	204,006
	Ketchum						
9/ Swede-Blaine Complex	Swede	36	Excessive coarse fragment content	0	Excessive coarse fragment content	45.5	220,220
	Blaine						
10/ Erickson	Ericson	20	--	0	--	23.39	63,019
13/ Blaine-Dranyon Complex	Blaine	0	Excessive coarse fragment content	24 (0-24)	Excessive coarse fragment content	60.06	193,794
	Dranyon[5]						
14/ Blaine-Jughandle Complex	Blaine	0	Slope[3]	17 (0-17)	Excessive coarse fragment content and low organic matter below 17 inches	7.18	16,449
	Jughandle						

MAP UNIT[1]	SOIL FAMILY	SUITABLE TOPSOIL/GROWTH MEDIUM		MARGINALLY SUITABLE TOPSOIL/GROWTH MEDIUM		ACRES WITHIN PANELS F & G (INCLUDES PROPOSED LEASE MODIFICATIONS)	TOPSOIL/GROWTH MEDIUM VOLUME (BCY)
		SOIL DEPTH (INCHES)[2]	CONSTRAINTS	SOIL DEPTH (INCHES)[2] AND HORIZON DEPTHS	CONSTRAINTS		
16/ Cloud Peak	Cloud Peak	0	Excessive coarse fragment content	24 (0-24)	Excessive coarse fragment content	0.16	516
17/ Farlow-Blaine Complex	Farlow	0	Slope[3]	24 (0-24)	Excessive coarse fragment content	151.71	489,518
	Blaine						
18/ Starman-Rock Outcrop Complex	Starman	0	Excessive coarse fragment content and slope[3]	6 (0-6)	Excessive coarse fragment content	24.21*	23,435
	Rock outcrop	0	Rock outcrop	0	Rock outcrop		
19/ Judkins-Blaine Complex	Judkins	7	Excessive coarse fragment content or slope[3]	17 (7-24+)	Excessive coarse fragment content or Selenium[4]	197.48	637,202
	Blaine						
20/ Karlan-Dranyon Complex	Karlan	0	Selenium[4]	28 (0-28)	Selenium[4]	62.89	250,955
	Dranyon[5]						
21/ Dranyon-Ericson Complex	Dranyon[5]	28	--	0	--	26.3	98,863
	Ericson						
22/ Judkins Silt Loams	Judkins	22 (7-29)	Excessive coarse fragment content	7 (0-7)	Excessive coarse fragment content and Selenium[4]	42.37	164,740
24/ Cloud Peak Silt Loams	Cloud Peak	0	Excessive coarse fragment content	24	Excessive coarse fragment content	65.95	212,799
25/ Jughandle Silt Loam	Jughandle	0	Slope[3]	17 (0-17)	Low organic matter below 17 inches and slope[3]	35.66	81,695
26/ Starley	Starley	0	Excessive coarse fragment content	6 (0-6)	Excessive coarse fragment content	0.68	549
TOTAL						992.83	3,216,053

Source: Maxim 2004f

1. Map units are identified on **Figures 3.4-1** and **3.4-2**.
2. Soil depth is the average recoverable depth, generally to the bottom of the B horizon or to a depth where more than 35% of the profile contains coarse fragments greater than 3 inches in size. Materials below this depth may be suitable at some individual sites.
3. Equipment restrictions exist in areas with >40% slope.
4. Total Selenium >13 mg/Kg or Extractable Se >0.10 mg/Kg
5. Laboratory analyses for selenium, organic matter, and coarse fragment content were not conducted for Dranyon soils.

* Rock outcrop comprises between 35-40% of these map units, therefore acreage has been reduced for the cubic yard calculations.

3.4.4 Erosion Potential

The overall hazard of erosion for soils has previously been determined by soil surveys conducted within the watershed area (USDA 1990; USDA 1976). Soil erosion, combined with other impacts from forest disturbances, such as soil compaction, can reduce forest sustainability and soil productivity (Elliot et al. 1996). In general, upland areas are more susceptible to erosion than lowland sites, and areas with higher coarse fragment content and lower slope angle have lower potential for water erosion hazard.

Elliot et al. (1996) determined that soil erosion in an undisturbed forest is extremely low, generally under 0.5 tons per acre per year (tons/acre/yr). Disturbances can dramatically increase soil erosion to levels exceeding 50 tons/acre/yr (Elliot et al 1996). These disturbances may include natural events such as wildfires and mass movements, as well as human induced disturbances such as road construction and timber harvesting (Elliot et al 1996).

Soil loss tolerance (T-factor) is defined as the maximum rate of annual soil erosion at which the quality of a soil as a medium for plant growth can be maintained (USDA 2003b). The T-factor is represented by integer values ranging from 1 to 5 tons per acre per year (USDA 1993). The factor of 1 ton per acre per year is for shallow or otherwise fragile soils, and 5 tons per acre per year is for deep soils that are least subject to damage by erosion (USDA 1993). A T-factor rating is assigned to soils without respect to land use or cover and represents the soil loss from wind and water erosion (USDA 2003b). Select published data on rates of soil formation and plant productivity responses to erosion indicate that tolerable soil losses vary widely for croplands (DeBano and Wood 1992). Data for rangelands are essentially nonexistent, although values of 4.5 tons per acre per year have been estimated for shallow soils on rangeland sites (DeBano and Wood 1992).

The soil suitability assessment identifies limitations and suggests that certain areas disturbed by the Project would experience increased erosion potential by water due to the steep slopes in the Project Area. **Table 3.4-5** identifies the erosion potential and hydrologic characteristics of soils in the Project Area. These soil erodibility characteristics are described in the *Soil Survey Manual* (USDA 1993) and summarized below.

Wind Erodibility Group (WEG)

The WEG for each soil was determined based on soil texture using the *National Soil Survey Handbook* (USDA 2003b) and soil information presented in Maxim (2004f). WEGs are based on the compositional properties of the surface horizon that are considered to affect susceptibility to wind erosion. These properties include texture, presence of carbonate, and the degree of decomposition of organic soils. The wind erodibility index of each WEG is the theoretical, long-term amount of soil lost per year through wind erosion (USDA 1993). Significant proportions of clay content, organic matter, and coarse fragment content decrease the wind erosion potential. Silt loam is the soil texture that is most susceptible to wind erosion. Wind erosion potential has been rated as moderate for the majority of soils within the Project Area, with the exception of the Karlan, Ketchum, Starley, and Starman soils, which have low wind erodibility ratings. There are no soil types in the Project Area categorized as highly susceptible to wind erosion (Maxim 2004f).

Course Fragment Content

Typical soils within the Project Area have been determined to have a surface coarse fragment content from 3 to 20 percent. The Farlow, Judkins, Ketchum, Povey, Starley, and Starman soil types characteristically have 20 to 43 percent surface coarse fragments, with some profile layers containing as much as 70 percent coarse fragments. The majority of soils contain a range of 1.6 to 10.5 percent organic matter in the top few inches of the soil profile, with an average of approximately 4.4 percent.

K-Factor

The K-factor is a relative index of the susceptibility of bare, cultivated soil to particle detachment and transport by rainfall (USDA 1993). A high K-factor value indicates greater susceptibility of the soil to erosion by water and provides a quantification of the hazard. The K-factor may be computed from the composition of the soil texture and structure, and may be influenced by organic matter and surface coarse fragment content. The fine sand and silt fractions of soil are most susceptible to erosion, while organic matter and coarse fragments reduce susceptibility to erosion (Maxim 2004f). Water erosion hazard for soils within the Project Area has been determined to be moderate for all map units except the Cluff, Harkness, and Parkay soils with high water erodibility, and the Povey and Moonlight soils with low water erodibility. Soils with greater than 25 percent coarse fragments by volume would have dramatically reduced susceptibility to water erosion (Maxim 2004f). When adjusted for the generally excessive coarse fragment content of the native soils, the Blaine, Cloud Peak, Farlow, Judkins, Ketchum, Starley, and Starman soil types would be classified as having a low hazard for water erosion, rather than a moderate hazard as shown in **Table 3.4-5**. The overall erosion hazard rating is based on the combination of the WEG and K-factor values and has been adjusted for coarse fragment content.

Available Water Capacity (AWC)

AWC is the volume of water that should be available to plants if the soil, inclusive of coarse fragments, were at field capacity (USDA 1993; 2003b). It is commonly estimated as the amount of water held between field capacity and wilting point, with corrections for salinity, fragments, and rooting depth. This is an important soil property in developing water budgets, predicting droughtiness, designing and operating irrigation systems, designing drainage systems, protecting water resources, and predicting yields (USDA 2003b). Depending on their abundance and porosity, rock and pararock fragments reduce AWC. Soils high in organic matter have higher AWC than soils low in organic matter if the other properties are the same.

Drainage Class

Drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods (USDA 2003b). Soils in the Project Area are generally well drained to somewhat excessively drained, which indicates that water is removed from the soil readily and sometimes rapidly. None of the soils in the Project Area have been classified as poorly drained. Therefore, drainage is not a factor that would inhibit growth of roots for significant periods during most growing seasons.

Soil Permeability

Soil permeability is the quality of the soil that enables water or air to move through it. Historically, soil surveys have used permeability coefficient or permeability as a term for saturated hydraulic conductivity (USDA 2003b). The soil properties that affect permeability are distribution of pore sizes and pore shapes. Texture, structure, pore size, and density are properties used to estimate permeability since the pore geometry of a soil is not readily observable or measurable (USDA 2003b).

TABLE 3.4-5 EROSION POTENTIAL AND HYDROLOGIC CHARACTERISTICS OF SOILS IN THE PROJECT AREA

SOIL FAMILY	SLOPE (PERCENT)	DRAINAGE	PERMEABILITY	AVAILABLE WATER HOLDING CAPACITY	WATER ERODIBILITY[1] (K-FACTOR)	WIND ERODIBILITY[2] (WEG)	SURFACE COARSE FRAGMENTS[3]	OVERALL EROSION HAZARD [4]
Blaine	10-70	Well drained	Moderate to moderately slow	Moderate	Moderate (0.26)	Moderately erodible (5)	18	Low to moderate
Cloud Peak	15-60	Very well drained	Moderate to moderately slow	Moderate	Moderate (0.39)	Moderately erodible (5)	16	Low to moderate
Cluff	40-55	Well drained	Moderately slow	High	High (0.47)	Moderately erodible (5)	15	Moderate to high
Dranyon	0-70	Well drained	Moderate to moderately slow	Very high	Moderate (0.29)	Moderately erodible (5)	9	Moderate
Ericson	2-60	Well drained	Moderately slow	High	Moderate (0.33)	Moderately erodible (5)	10	Moderate
Farlow	0-70	Somewhat excessively drained	Moderately rapid	High	Moderate (0.27)	Moderately erodible (5)	23	Low to moderate
Harkness	10-50	Well drained	Slow	High	High (0.48)	Moderately erodible (5)	0	Moderate to high
Judkins	2-65	Well drained	Moderately slow	Moderate	Moderate (0.36)	Moderately erodible (5)	23	Low to moderate
Jughandle	30-50	Somewhat excessively drained	Moderate to moderately rapid	Moderate	Moderate (0.28)	Moderately erodible (3)	3	Moderate
Karlan	10-60	Well drained	Moderate to moderately rapid	Very high	Moderate (0.35)	Low erodibility (6)	7	Low to moderate
Ketchum	10-70	Somewhat excessively drained	Moderately rapid	Low	Moderate (0.33)	Low erodibility (8)	29	Low
Nisula	10-70	Well drained	Moderately slow to slow	High	Moderate (0.37)	Moderately erodible (5)	18	Moderate
Parkay	10-70	Well drained	Moderate to moderately slow	High	High (0.44)	Moderately erodible (5)	17	Moderate to high
Povey	0-60	Well drained	Moderately rapid to moderately slow	High	Low (0.20)	Moderately erodible (5)	43	Low to moderate
Redfeather	40-70	Somewhat excessively drained	Moderate	Very low	Moderate (0.37)	Moderately erodible (5)	0	Moderate

SOIL FAMILY	SLOPE (PERCENT)	DRAINAGE	PERMEABILITY	AVAILABLE WATER HOLDING CAPACITY	WATER ERODIBILITY[1] (K-FACTOR)	WIND ERODIBILITY[2] (WEG)	SURFACE COARSE FRAGMENTS[3]	OVERALL EROSION HAZARD [4]
Starley	10-70	Somewhat excessively drained	Moderate to moderately rapid	Very low	Moderate (0.34)	Low erodibility (8)	30	Low
Starman	15-70	Somewhat excessively drained	Moderate to moderately rapid	Very low	Moderate (0.31)	Low erodibility (8)	30	Low
Swede	5-65	Well drained	Moderate to moderately slow	Moderate	Moderate (0.28)	Moderately erodible (5)	11	Moderate
Thayne	2-40	Well drained	Moderate to moderately slow	High	Moderate (0.34)	Moderately erodible (5)	0	Moderate

Source: Maxim 2004f, USDA 1993.

[1] Relative index of susceptibility to water erosion (0.25=low, 0.25 to 0.40=moderate, >0.40=high).

[2] Wind Erodibility Group (WEG) rating (1-2 = highly erodible, 3-5 = moderately erodible, 6-8 = low erodibility).

[3] Values based on field estimates (Maxim 2004f).

[4] Hazard rating for a disturbed, unvegetated soil. Erodibility rating has been adjusted for coarse fragment content of native soils. Maxim (2004f) notes that soils with more than 25% coarse fragments by volume would have reduced susceptibility to water erosion.

3.4.5 Roads and Development

Areas of potential disturbance (mainly proposed haul/access road corridors) outside the 2nd Order soil inventory area have been described at the 3rd Order level (USDA 1990), and these soil land types are shown on **Figure 3.4-3**. **Table 3.4-6** identifies the suitability ratings of these soils for roads and development. Land types that are not within potential disturbance corridors are not further described in the table, although they are identified in **Figure 3.4-3**. Ratings are given for trafficability on unsurfaced roads, cut and fill erosion hazard, cut and fill revegetation limitations, cut slope stability hazard, and suitability for topsoil (USDA 1990).

Ratings for trafficability on unsurfaced roads assume use of native materials for the road running surface (USDA 1990). Ratings are based on characteristics such as soil texture, drainage, and coarse fragments. Soils containing large percentages of coarse fragments are not rated as suitable for unsurfaced roads. A rating of good indicates that the roadbed would be stable and require only occasional maintenance. A rating of fair indicates that the roadbed would yield limited volumes of sediment and require seasonal repair to maintain trafficability. A rating of poor indicates that roadbeds would yield high volumes of sediment and require frequent maintenance. Soils within the Study Area have been rated as poor to good for trafficability on unsurfaced roads.

Cut and fill erosion hazard ratings are for the period prior to revegetation and assume cut and fill slopes of 1h:1v (USDA 1990). The ratings are based on properties which affect soil movement caused by overland flow, including slope, coarse fragments, and surface erosion hazard. A rating of low indicates that resistance to erosion is sufficient to permit prolonged exposure of bare soil. A rating of moderate indicates that resistance to erosion is sufficient to permit temporary exposure of bare soil, necessitating standard revegetation practices. A rating of high indicates that unprotected cuts and fills would yield high volumes of sediments, requiring special protective measures. Within the Study Area, soils have a low to high rating for cut and fill erosion hazard, with the majority of soils in the moderate range.

Cut and fill revegetation limitation ratings assume uniform slopes with 1h:1v slope and seeding completed during the first growing season following construction (USDA 1990). The ratings are based on properties affecting the establishment of grasses, including mass stability, drainage, coarse fragments, soil texture, depth to bedrock, and slope. Soils that are shallow, rocky, unstable, or are located on steep slopes have severe limitations for establishing vegetation. A rating of slight indicates an acceptable revegetation response rate; moderate indicates a limited response, and severe indicates that a slow revegetation response can be expected. Soils within the Study Area have been rated as slight to severe for cut and fill revegetation suitability.

Cutslope stability hazard ratings assume construction on uniform slopes with cuts greater than five feet high, a 1h:1v final slope, and revegetation following construction (USDA 1990). These ratings are based on soil properties affecting stability of mechanically disturbed slopes including mass stability, texture, drainage, and slope. Wet soils with uniform particle size on steep, naturally unstable slopes have the highest hazard. A rating of low indicates that no appreciable hazard of mass failure on cut and fill slopes exists. A rating of moderate indicates that seasonal repair of roads would be needed because of potential mass failures, and a rating of high indicates that cut and fills may yield excessively high volumes of material from mass failures, necessitating constant repairs. Within the Study Area, soils have a low to high rating for cut slope stability hazard, with the majority of soils in the moderate range.

TABLE 3.4-6 ROADS AND DEVELOPMENT SUITABILITY

LAND TYPE[1] & SOIL FAMILIES	UNSURFACED ROAD TRAFFICABILITY	CUT & FILL EROSION HAZARD	CUT & FILL REVEGETATION LIMITATION	CUT SLOPE STABILITY HAZARD	TOPSOIL SUITABILITY
061 Venable-Argic Cryaquolls-Coski	Poor to Good	Low to Moderate	Slight to Moderate	Low	Poor to Good
082 Rooset-Beaverdam-Toone	Poor to Fair	Moderate to High	Moderate	Low to Moderate	Fair to Good
201 Farlow-Judkins-Starley	Poor	Moderate to High	Moderate to Severe	Low	Poor
300 Ericson-Cloud Peak-Ketchum	Poor to Good	Low to Moderate	Slight to Moderate	Low to Moderate	Poor
301 Blaine-Dranyon	Good	Moderate	Moderate	Low	Fair to Good
380 Povey-Alpon-Ketchum	Fair to Good	Low to Moderate	Slight to Severe	Low to Moderate	Poor to Good
381 Parkay-Judkins-Farlow	Fair to Good	Low to Moderate	Slight to Severe	Low	Poor to Good
404 Judkins-Farlow-Swede	Fair to Good	Moderate to High	Moderate to Severe	Low to Moderate	Poor
405 Starley-Povey-Farlow	Fair to Good	Moderate to High	Moderate to Severe	Moderate	Poor
451 Beaverdam-Swede-Dranyon	Poor to Fair	Low to Moderate	Slight	Moderate to High	Fair to Good
473 Dranyon-Judkins-Povey	Poor to Fair	Moderate to High	Moderate to Severe	Low to Moderate	Poor to Fair
553 Blaine-Nisula-Calcic Cryoborolls	Poor to Good	Moderate to High	Moderate to Severe	Low to Moderate	Poor
653 Judkins-Nisula-Farlow	Poor to Fair	Moderate to High	Moderate to Severe	Low to Moderate	Poor
656 Cloud Peak-Jughandle-Swede	Fair	Low to Moderate	Moderate to Severe	Low to Moderate	Poor
755 Ketchum-Nisula-Farlow	Poor to Good	Moderate to High	Moderate to Severe	Low to Moderate	Poor
912 Calcic Cryoborolls-Starley-Judkins	Fair to Good	Moderate to High	Severe	Low to Moderate	Poor

Source: USDA 1990
[1]Map units described in this table are identified on **Figure 3.4-3**

Ratings for suitability for topsoil assume stripping of surface layers for storage and later use as a growth medium for revegetation (USDA 1990). Growth medium recovered from road surfaces typically remains adjacent to the road for use during reclamation. The suitability ratings are based on properties which affect reclamation of the borrow area as well as ease of excavation, loading, and spreading. These properties include depth to bedrock, soil texture, coarse fragments, layer thickness, slope, and depth to a high water table. A rating of poor indicates that the material is an improbable source of growth for revegetation; a rating of fair indicates the material is a probable source with some limitations, and a rating of good indicates that the material is a probable source of growth medium. Within the Study Area, soils have a low to high rating for topsoil suitability, with the majority of soils in the poor range. It should be noted that the topsoil suitability criteria for roads and development are based on suitability criteria identified in the 3rd Order Soil Survey (USDA 1990). Topsoil suitability ratings identified in **Table 3.4-6** do not include laboratory analyses from the 2nd Order analysis (Maxim 2004f) and are not determined using criteria identified in **Table 3.4-2**.

3.4.6 Selenium and Trace Elements in Soils

Selenium

As documented elsewhere in this EIS, selenium has been identified as a concern in Southeastern Idaho where phosphate mining activities have caused surface disturbance with mine overburden. Because selenium in growth medium and water resulting from certain phosphate overburden can bio-accumulate in plants, animals consuming a constant diet of contaminated plants can be exposed to elevated levels of selenium. These selenium levels have the potential to exceed concentrations considered hazardous to livestock. Both deficient and toxic levels of selenium cause similar effects, including reproductive depression, anemia, weight loss, and immune dysfunction (Koller and Exon 1986). Similar toxic effects could occur in terrestrial wildlife, although the pathology is not as well understood.

The range of naturally occurring selenium concentrations in soils of the western United States is less than 0.1 to 4.3 mg/Kg, and the mean concentration is 0.23 mg/Kg (Shacklette and Boerngen 1984). Selenium is considered a metalloid, possessing both metallic and non-metallic properties, and can exist in an amorphous state or in any of three crystalline forms (Haws and Möller 1997). It exists in four oxidation states including selenate (Se^{+6}), selenite (Se^{+4}), elemental selenium (Se^{0}), and selenide (Se^{-2}). Elemental selenium is present in minute amounts, and selenides are typically associated with sulfides and are largely insoluble (Haws and Möller 1997).

Selenium enters the soil profile through the weathering of selenium-rich rocks. Water and wind erosion and sedimentation processes distribute these particles and deposit them into topsoil. Selenium moves through the soil until adsorbed on metal hydroxides, or organic particles.

Selenite and selenate are produced by chemical oxidation and soil microorganisms from less soluble forms of selenium. These forms are highly soluble in alkaline soils, thus facilitating uptake of selenium by certain plants. Selenate is generally the more toxic form in soils, since selenite is adsorbed to hydrous metal oxides and is generally unavailable for plant uptake (Mayland et al. 1991). The major form of selenium found in well-aerated alkaline soils is selenate, whereas selenite predominates in acid and neutral soils (Mayland et al. 1991).

Selenium mobility in soils is favored by alkaline pH, high selenium concentrations, oxidizing conditions, and high concentrations of other strongly adsorbed anions. Selenates are significantly more stable and soluble than selenites, especially in alkaline environments (Haws and Möller 1997). Adsorption of selenite is influenced positively by low pH, organic carbon, hydrous oxides, calcium carbonate, and cation exchange capacity, and negatively influenced by high salt, alkalinity, and high pH. Sorption of both selenite and selenate decreases with increasing pH (Munkers 2000). Studies conducted by Mayland et al. (1991) indicate that sorption of selenite by soil shows some analogies to the sorption of phosphate, whereas the sorption of selenate is closer to that of sulfate. Some soil anions, such as phosphate, increase plant selenium uptake because increased soil-solution anion concentrations compete with selenium anions for adsorption sites on soil particles. Other anions, such as sulfate, actually inhibit uptake by affecting plant metabolism. The antagonistic effect of selenium and sulfate can reduce selenium availability. For example, Mayland et al. (1991) shows that the addition of lime to soils containing sulfur often mobilizes selenium by precipitating the sulfate ion. This results in greater selenium uptake by vegetation. Mayland et al. (1991) cited Ylaranta (1983) who found selenate was reduced by added organic matter (peat) and subsequently rendered immobile by adsorption onto clay. Munkers (2000) reviewed literature showing that selenium-reducing bacteria can reduce soluble, oxidized forms to insoluble forms.

US Department of the Interior (USDI 1998) indicates that the presence of selenium in geologic formations does not mean it is present in toxic amounts in the soils derived from these strata. Herring (1990) states that an important consideration of selenium behavior in soils is of assimilation and availability. The most important observation is that neither assimilation or availability of the element necessarily correspond to its soil concentration. An example cited in Herring (1990) indicated that in the case of acidic soils that contain an abundance of iron, iron selenite compounds or complexes form, and these are sufficiently insoluble to reduce the bioavailability of the selenium. Thus, acid soils favor the more reduced, complexed forms of selenium, such as ferric selenite, which are not readily available to plants. Oxidation by chemical and bacterial processes in alkaline soils favors the existence of selenate compounds of complexes, and these are soluble and readily assimilated by plants (Herring 1990).

Selenium has been identified as a parameter affecting soil management. USFS guidelines for phosphate mine reclamation have been developed for topsoil/growth medium salvage relative to this element (USDA 2003a). This document provides guidance and does not impose legally binding requirements or imply policy. The guideline states that soil with less than 13 milligrams per kilogram (mg/Kg) total selenium or less than 0.10 mg/Kg extractable selenium are known to be suitable for reclamation. Implementation of these guidelines for soil salvage and use as growth medium could reduce the amount of selenium available for uptake by plants. Soils, weathered in place on the landscape appear to have been depleted of most of their bioavailable selenium (USDA 2003a). Salvage soil materials with total selenium values up to 13 mg/Kg are considered suitable for use as a planting medium when used in combination with other preventative BMPs designed for the long-term protection of reclamation plantings (USDA 2003a). Under the guidelines, soils with selenium values above 13 mg/Kg may also be acceptable for reclamation with additional testwork. The guideline of 13 mg/Kg was established because soils with concentrations above 13 mg/Kg were not available for testing.

Concentrations of selenium in topsoil/growth medium samples collected within the Project Area are below detection limits in most soil samples. Only one sample site from the Project Area exhibited elevated total selenium levels, and this occurred in Panel G at depths greater than 54 inches.

Naturally occurring selenium concentrations in soil vary greatly depending on the profile location. When soils are salvaged for proposed mining operations, soil from different areas can become mixed, reducing selenium concentrations in the soil mixture. The total concentration of selenium in soils does not directly determine the concentration of available selenium in the plants growing on those soils (Lakin 1972; Fisher 1991). **Table 3.4-7** shows the maximum selenium and trace element concentrations for sampled soils within the Project Area. Laboratory analyses indicate the total selenium concentrations were generally less than analytical detection limits at all sample locations (Maxim 2004f), with the following exceptions:

- The Judkins soil type at sample site G-TP-5 contained 3 mg/Kg of selenium in the top 7 inches of the profile and 6 mg/Kg in the 7 to 27-inch interval depth of the profile.
- Karlan soil at sample site G-TP-33 showed total selenium levels of 24 mg/Kg in soils greater than 54 inches deep, with 7-12 mg/Kg total selenium levels throughout the upper layers of the profile.
- Two profile layers of the Ketchum soil at sample site F-TP-48 showed total selenium values of 6 to 8 mg/Kg. These profile layers were separated by 20 inches of soil with non-detectable selenium levels.

The above values for total selenium are not elevated and are considered suitable for topsoil/growth medium recovery and use in reclamation (USDA 2003a), with the exception of the Karlan soil occurring deeper than 54 inches at site G-TP-33, which by itself would not be suitable for reclamation due to elevated selenium content.

TABLE 3.4-7 MAXIMUM SELENIUM AND TRACE ELEMENT CONCENTRATIONS FOR SAMPLED SOILS WITHIN THE PROJECT AREA

ANALYTICAL RESULTS – EXTRACTABLE (MG/KG)[1]					ANALYTICAL RESULTS – TOTAL (MG/KG)[1]			
SOIL TYPE	CADMIUM	NICKEL	SELENIUM	ZINC	CADMIUM	NICKEL	SELENIUM	ZINC
Blaine	1.1	1	0.15	7.7	2	36	ND	156
Cloud Peak	2.9	0.8	0.13	9.4	8	33	ND	280
Ericson	1.1	36	0.26	5	2	49	ND	207
Farlow	0.5	1.4	0.10	3.3	ND	40	ND	209
Judkins	30	217	0.14	67.2	12	244	6	944
Jughandle	3.5	1.4	0.07	6.4	16	56	ND	348
Jughandle (variant)	0.1	0.9	0.12	1.2	ND	13	ND	52
Karlan	9.8	41.7	0.14	70.5	24	125	24	520
Ketchum	0.7	0.6	0.06	3.5	1	33	8	121
Moonlight	16	6.9	0.07	65.3	59	71	ND	906
Parkay	0.6	1.8	0.10	--	ND	32	ND	245
Povey	5.3	5.5	0.08	47.7	13	86	ND	512
Starman	0.4	0.3	0.04	2.3	ND	22	ND	75
Swede	0.2	0.6	0.14	2.4	ND	15	ND	61

Source: Maxim 2004f
[1] Maximum value reported at any sample site, in any single soil horizon.
ND = Not Detected (Indicates nonspecific value below detection limit).
- - = Not noted or analysis not requested.

Extractable selenium concentrations were generally less than 0.1 mg/Kg, indicating that the hazard for excessive selenium uptake in vegetation in undisturbed soil is low, with the following exceptions:

- Judkins soil type at sample site F-TP-9 contained 0.14 mg/Kg of extractable selenium in the top seven inches of the profile. The remainder of the profile (7-29 inches) showed extractable selenium of less than 0.10 mg/Kg.
- The Farlow soil at sample site F-TP-10 had extractable selenium content of 0.10 mg/Kg in profile layers below 28 inches (28-40 inches).
- At sample site F-TP-22, the Blaine soil had extractable selenium levels of 0.12 to 0.15 mg/Kg in the soil profile layers below six inches (6-19 inches).
- The Ericson soil had extractable selenium of 0.12 mg/Kg in the soil layer between 15-21 inches and 0.26 mg/Kg in soil below 21 inches (21-26 inches) at sample site F-TP-27.
- The Karlan soil at sample site G-TP-33 showed extractable selenium levels ranging from 0.10 to 0.13 mg/Kg in three of the six soil profile layers. This site also had total selenium of 24 mg/Kg below 54 inches. At sample site F-TP-58, Karlan soil showed extractable selenium levels ranging from 0.11 to 0.14 mg/Kg throughout the soil profile (0-44 inches).
- Cloud Peak soil at sample site F-TP-45 showed extractable selenium of 0.12 mg/Kg in the 16-23 inch layer. The remainder of the profile (23-55 inches) showed extractable selenium of less than 0.10 mg/Kg. At sample site F-TP-67, the Cloud Peak soil had extractable selenium of 0.13 mg/Kg in soils greater than 20 inches deep.
- At sample site F-TP-46, the Swede soil had one layer (20-33 inches) that showed extractable Se of 0.13 mg/Kg. The remaining portions of the profile (0-20 and 33-45 inches) showed extractable selenium of less than 0.10 mg/Kg. At sample site F-TP-55, the Swede soil showed extractable selenium levels ranging from 0.11 to 0.14 mg/Kg throughout the soil profile (0-28 inches).
- The Parkay soil at site F-TP-59 showed extractable selenium at 0.1 mg/Kg below 16 inches deep.
- Jughandle soil variant at sample site F-TP-63 showed extractable selenium levels ranging from 0.11 to 0.12 mg/Kg throughout the soil profile (0-28 inches).

It should be noted that individual soil sample sites may not be representative of the surrounding soil in the major map unit. The Swede soil sample taken at site F-TP-46 indicated elevated extractable selenium, but this does not represent the majority of soil types within the Judkins-Blaine Complex that have selenium levels below the 0.10 mg/Kg guideline. In comparison, three samples were taken within the Karlan-Dranyon Complex (Map Unit #20), including samples of the Karlan soil, the Swede inclusion, and the Jughandle (variant) inclusion. All three of these sample sites showed elevated extractable selenium levels throughout the entire soil profile. This map unit is composed of approximately 50 percent Karlan soil, 30 percent Dranyan soil, and the remaining 20 percent is represented by inclusions.

Cadmium

All soils and rocks have some cadmium in them. It is generally found at low concentrations in the environment and typical background concentration of cadmium in western United States soils is less than 1.5 mg/Kg (EPA 2003b). The Soil Screening Level (SSL) for cadmium in plants is 32 mg/Kg (dry weight in soil) and the soil invertebrate SSL for cadmium is 140 mg/Kg (EPA 2003b). The cadmium SSL for avian wildlife is 1.0 mg/Kg and the SSL for mammalian wildlife is 0.38 mg/Kg (EPA 2003b). With the exception of the mammalian value, these concentrations are higher than the 50th percentile of reported background soil concentrations in eastern and western U.S. soils (0.23 and 0.40 mg/Kg dry weight, respectively). Cadmium is adsorbed in soil to a much lesser extent than most other metals (EPA 2003b). The most important soil properties influencing adsorption are pH and organic content. Adsorption increases with pH and organic content, therefore, leaching is more apt to occur under acid conditions in sandy soil (EPA 2003b). Plant uptake of cadmium decreases as soil pH increases. In soil, cadmium is expected to convert to more insoluble forms, such as cadmium carbonate in aerobic environments and cadmium sulfide in anaerobic ones (EPA 2003b).

Nickel

The normal range of nickel concentration in soil is between 4 and 80 mg/Kg. Shacklette and Boerngen (1984) calculated the mean concentration of nickel in western United States soils to be 15 mg/Kg. Nickel attaches to soil particles that contain iron or manganese, which are often present in soil and sediments (ATSDR 2003b). It is usually attached so strongly onto the soil and rock particles that it is not readily taken up by plants and animals, although under acidic conditions nickel is more mobile in soil. Nickel does not appear to collect in fish, plants, or animals used for food (ATSDR 2003b). The International Agency for Research on Cancer (IARC) has determined that nickel metal may possibly be carcinogenic to humans, and that some nickel compounds are carcinogenic to humans (ATSDR 2003b).

Zinc

Zinc (Zn) is the 23rd most abundant element in the earth's crust and is an essential element for proper growth and development of humans, animals, and plants (USGS 2004c). It is the second most common trace metal, after iron, naturally found in the human body (USGS 2004c). Zinc is bioaccumulated by all organisms, even in areas of low zinc concentrations, and both deficient and excessive amounts cause adverse effects in all species (USDI 1998). It is highly reactive and is present as both soluble and insoluble compounds. Typical background concentrations of zinc in western United States soils are less than 150 mg/Kg and Shacklette and Boerngen (1984) calculated the mean concentration to be 55 mg/Kg. USDI (1998) identified the level of concern for zinc in sediment to be 150-410 mg/Kg; however, sulfides in sediment may reduce zinc toxicity. Zinc toxicity in water is affected by water hardness, pH, temperature, dissolved oxygen, and alkalinity. In most of the West, water hardness of more than 200 mg/L is common, and zinc would be less toxic under those conditions (USDI 1998). USDI (1998) also notes that most of the zinc introduced into the aquatic environment is eventually deposited in sediments.

3.5 Vegetation

3.5.1 Introduction

The CNF, its uses, and resources are managed with the guidance of the RFP (USFS 2003a). The Desired Future Conditions (DFC) and objectives for forest and non-forest vegetation are achieved by using the forest-wide standards and guidelines and the standards and guidelines for the Biological Elements section as set forth in the Management Prescriptions of the RFP. Maxim conducted a baseline assessment of vegetation resources within the Study Area during 2003. These studies provided baseline data on vegetation resources that might be influenced by any of the Action Alternatives. A baseline technical report was prepared and provides details on Maxim's methodologies, results, and conclusions (see Maxim 2004e). The following is largely summarized from this report. Additional pertinent information is also included and cited appropriately.

3.5.2 Cover Type Descriptions

The Study Area ranges in elevation from about 6,500 feet in the lower end of the South Fork Sage Creek, Manning Creek, and Deer Creek drainages, to about 8,500 feet along Freeman

Ridge west of Panels F and G. Vegetation within the Study Area is common to this portion of the CNF with both forested and non-forested cover types. Maxim (2004e) assessed, described, and mapped ten vegetation cover types in the Study Area (**Figure 3.5-1**). **Table 3.5-1** shows the acres and relative occurrence of each type.

TABLE 3.5-1 VEGETATION COVER TYPES, ACRES, RELATIVE OCCURRENCE, AND PRINCIPAL PLANT SPECIES IN THE STUDY AREA

COVER TYPE (ACRES/OCCURRENCE[1])	PRINCIPAL PLANT SPECIES	
	SCIENTIFIC NAME	COMMON NAME
Aspen (6,702 / 32.8%)	*Populus tremuloides*	Quaking aspen
Mountain Big Sagebrush (5,479 / 26.8%)	*Artemisia tridentata* ssp. *Vaseyana* *Purshia tridentata* *Symphoricarpos oreophilus*	Mountain big sagebrush Antelope bitterbrush Mountain snowberry
Subalpine Fir (3,056/14.9%)	*Abies lasiocarpa* *Pinus contorta* *Populus tremuloides*	Subalpine fir Lodgepole pine Quaking aspen
Aspen/Conifer (1,593 / 7.8%)	*Populus tremuloides* *Pseudotsuga menziesii* *Pinus contorta*	Quaking aspen Douglas-fir Lodgepole pine
Riparian Shrub/Wet Meadow (1,546 / 7.5%)	*Carex nebrascensis* *Deschampsia caespitosa* *Salix boothii* *Salix drummondii* *Lonicera utahensis*	Nebraska sedge Tufted hairgrass Booth's willow Drummond's willow Utah honeysuckle
Mountain Snowberry/Sagebrush (932 / 4.5%)	*Symphoricarpos oreophilus* *Artemisia tridentata* ssp. *Vaseyana* *Prunus virginiana* *Amelanchier alnifolia* *Rosa* spp. *Ceanothus velutinus*	Mountain snowberry Mountain big sage Chokecherry Serviceberry Rose Snowbrush
Douglas-Fir (456 / 2.2%)	*Pinus contorta* *Abies lasiocarpa* *Pseudotsuga menziesii*	Lodgepole pine Subalpine fir Douglas-fir
Forb/Graminoid (341 / 1.7%)	*Delphinium bicolor* *Geranium viscosissimum* *Veratrum californicum*	Little larkspur Sticky geranium California false hellebore
Mountain Big/Silver Sagebrush (187 / 0.9%)	*Artemisia tridentata* ssp. *vaseyana* *Artemisia cana*	Mountain big sage Silver sage
Mountain Mahogany (180 / 0.9%)	*Cercocarpus ledifolius*	Mountain mahogany

[1]Occurrence expressed as % of total Study Area (20,462 acres)

Aspen

Aspen (*Populus tremuloides)* is the most abundant (32.8 percent) cover type in the Study Area. Aspen stands are primarily located on east- and southeast-facing slopes. This cover type is an early-seral (i.e., pioneer) stage on nearly every moist Douglas-fir (*Pseudotsuga menziesii*) site, and many mixed conifer and subalpine fir/Engelmann spruce (*Abies lasiocarpa*/*Picea engelmannii*) sites on the CNF (USFS 2003a). Aspen communities within the Project Area are typically closed canopy stands of aspen with a few conifers, usually Douglas–fir. The understory consists mainly of mountain snowberry (*Symphoricarpos oreophilus*), sweet cicely (*Osmorhiza chilensis*), sticky geranium (*Geranium viscosissimum)*, meadowrue (*Thalictrum occidentalis*), and silvery lupine (*Lupinus argenteus* var. *parviflorus*). Intermediate and older

Figure 3.5-1 Vegetation Cover Types in Project Area

aspen stands are located at higher elevations, while younger stands are common at the lower elevations, usually in drainages. Below the elevation range of conifers, aspen stands may indicate a late-seral (i.e., climax) condition.

Mountain Big Sagebrush

Mountain big sagebrush (*Artemisia tridentata* ssp*. vaseyana*) is the second most abundant (26.8 percent) cover type in the Study Area, found at lower elevations and on dry south-facing slopes. Mountain big sagebrush is the dominant plant species, with mountain snowberry and antelope bitterbrush (*Purshia tridentata)* found occasionally. Forb and grass species found in this cover type include arrowleaf balsamroot (*Balsamorhiza sagittata*), silky lupine (*Lupinus sericeus*), bluebunch wheatgrass (*Agropyron spicatum*), Kentucky bluegrass *(Poa pratensis*), and western needlegrass (*Stipa occidentalis*).

Mountain Big/Silver Sagebrush

The mountain big/silver (*Artemisia cana)* sagebrush cover type is co-dominated by both species and is found on more mesic (moderately moist habitat) sites at lower elevations. This cover type accounts for 0.9 percent of the Study Area. Associated forbs include death camas (*Zigadenus paniculatus*) and monument plant (*Frasera speciosa*).

Douglas-Fir

The Douglas-fir cover type, 2.2 percent of the Study Area, is found on the east-facing slopes from Deer Creek north to Sage Creek. Two habitat types are associated with Douglas-fir.

- The Douglas-fir/mountain sweet-cicely (*Osmorhiza chilensis*) habitat type is a predominant habitat type in southern Idaho and northern Utah (Steele et al. 1983) and occupies slopes with relatively moist soils. Douglas-fir is the dominant overstory species, with 45-65 percent canopy cover. Aspen and Lodgepole pine (*Pinus contorta*) are often interspersed. The understory usually contains high shrub cover, including mountain snowberry, chokecherry (*Prunus virginiana*), and serviceberry (*Amelanchier alnifolia*). Herbaceous species include mountain sweet-cicely, sticky geranium, wild strawberry (*Fragaria vesca*), pinegrass (*Calamagrostis rubescens*), and elk sedge (*Carex geyeri*).

- The Douglas-fir/pinegrass habitat type occurs on drier and cooler sites, usually on gentler slopes (5-25 percent). Overstory species consist of Douglas-fir, lodgepole pine, and occasionally subalpine fir. Small pockets of large Douglas-fir, some over 30 inches in diameter, were observed in the Study Area. The Douglas-fir/pinegrass habitat understory consists of sparse shrub cover, including Utah honeysuckle (*Lonicera utahensis*), Oregon grape (*Berberis repens*), and wild rose (*Rosa* spp.). Herbaceous species include pinegrass, elk sedge, wild strawberry, and heart-leaf arnica (*Arnica cordifolia*).

Subalpine Fir

The Subalpine fir cover type occurs on 14.9 percent of the Study Area and is found on north-facing, cool slopes at relatively low elevations, and on all aspects at high elevations. The north-facing slopes of Deer Creek, Manning Creek, and Sage Creek drainages are inhabited by large stands of subalpine fir, dominated by an overstory of lodgepole pine. Aspen is often interspersed on east- and south-facing slopes in subalpine fir habitats. Three habitat types are associated with subalpine fir:

- The subalpine fir/pinegrass habitat type occupies cooler sites than the Douglas-fir/mountain sweet-cicely. The subalpine fir/pine grass habitat type understory is dominated with pinegrass and elk sedge, often exceeding 60 percent cover. Other associates include heart-leaf arnica, Oregon grape, and mountain snowberry.

- The subalpine fir/mountain sweet-cicely habitat type occupies cooler sites than the Douglas-fir/pinegrass habitat type and is dominated by aspen and a small number of Douglas-fir. Understory shrubs include mountain snowberry, serviceberry, and wild rose. Herbaceous species include mountain sweet-cicely, sticky geranium, wild strawberry, pinegrass, and Kentucky bluegrass.

- The subalpine fir/grouse whortleberry (*Vaccinium scoparium*) habitat type occupies the coldest sites in the Study Area. The overstory is dominated by lodgepole pine with sapling and pole-sized subalpine fir. The shrub understory is dominated by grouse whortleberry mixed with globe huckleberry (*Vaccinium globulare*), russet buffaloberry (*Shepherdia canadensis*), Utah honey suckle, and mountain lover (*Pachistima myrsinites*). Herbaceous species are sparse in this habitat type but include heart-leaf arnica, pinegrass, pipsissewa (*Chimaphila umbellata*), one-sided wintergreen (*Pyrola secunda*), and various species of hawkweed (*Hieracium* spp.).

Aspen/Conifer
The mixed aspen/conifer cover type comprises 7.8 percent of the Study Area and is interspersed among pure aspen and conifer stands. Trees in the aspen/conifer type are intermediate to mature in age, and many stands are potentially seral, succeeding from aspen to conifer. Dominant canopy species are quaking aspen, Douglas-fir, subalpine fir, and lodgepole pine. The understory consists mainly of mountain snowberry, meadowrue, sticky geranium, and pinegrass.

Riparian Shrub/Wet Meadow
The riparian shrub/wet meadow cover type makes up 7.5 percent of the Study Area and includes two separate vegetation communities: wet/sedge meadows and riparian shrub. These communities are associated with the high moisture levels found in the broad floodplain of Crow Creek and areas along Deer Creek. Wet/sedge meadows are dominated by Nebraska sedge (*Carex nebrascensis*) and tufted hairgrass (*Deschampsia caespitosa)*. The riparian shrub community is dominated by Booth's willow (*Salix boothii)*, Drummond's willow (*Salix drumondii)*, and Utah honeysuckle. **Section 3.6** provides a more detailed description and identification of delineated wetlands.

Riparian areas in the Study Area were evaluated for Proper Functioning Condition (PFC) in accordance with the procedures described in BLM (1993). Riparian areas associated with Crow Creek, Deer Creek, Wells Canyon drainage, South Fork Sage Creek, and Manning Creek were evaluated and compared to the CNF rating of functional capacity determined by CNF personnel in January 1999. The evaluations and comparisons of the riparian areas are as follows:

<u>Crow Creek</u>
Maxim (2004e) evaluated Crow Creek from the confluence of the Wells Canyon drainage to approximately five miles downstream to the confluence of Sage Creek. Crow Creek is a low-gradient stream with a broad floodplain up to 0.5 mile wide. According to Maxim (2004e), approximately 25-30 percent of the stream in the Study Area has been affected by grazing and the clearing of natural vegetation. Riparian areas have unstable banks that show signs of

accelerated erosion; some areas have been stabilized with riprap. Approximately 50 percent of the riparian area evaluated had vegetation densities in sufficient amounts to resist erosion along the banks of Crow Creek. The functional capacity is reduced by the scarcity of large woody debris in and adjacent to Crow Creek, and recruitment of tree and shrub species that generate woody debris is nearly non-existent. Crow Creek was rated as functioning-at-risk by Maxim (2004e) due to loss of woody vegetation, accelerated bank erosion on some reaches, placement of riprap, constriction of the stream channel by the Crow Creek Road, proposed expansion alternative of the road within the floodplain, and increased sediment loading from Crow Creek Road. In 2005, the CNF rated Crow Creek as functioning-at-risk but apparently trending upward (i.e., improving; USFS 2005a)

Deer Creek and Tributaries

Deer Creek and its tributaries drain the steep, mountainous terrain near the headwaters of Crow Creek. A floodplain has developed where the valleys in this drainage area become wider. Wetland and riparian vegetation covers most of these floodplains. Willows, with small patches of sedge meadows interspersed within, are found along the perennial and intermittent reaches of Deer Creek. Willows, native grasses, and sedges have been reduced in density and replaced by silver sagebrush, Kentucky bluegrass, and other invasive species including nemophila (*Nemophila breviflora*), bilobed speedwell (*Veronica biloba*), Canada thistle (*Cirsium arvense*), and Dyer's woad (*Isatis tinctoria*), a noxious weed. The perennial reach of upper South Fork Deer Creek is constrained by a Forest road located along the creek. The road is adding sediment to the creek from surface water runoff. Maxim found Deer Creek to be functioning-at-risk (Maxim 2004e). In 2005, the CNF also rated Deer Creek as functioning-at-risk but apparently trending upward (i.e., improving; USFS 2005a).

Wells Canyon Drainage

The Wells Canyon drainage was evaluated from its source at the uppermost spring down to the confluence with Crow Creek. This relatively high gradient drainage, which is mostly intermittent and confined by steep banks in a canyon, has a narrow strip of riparian vegetation that is primarily willows and sedges. The riparian vegetation in the upper drainage is not effective in withstanding high stream flows. There is little or no channel migration during high flows because of the presence of the Forest road in the canyon bottom and confining canyon slopes. Several camping sites and the road have been constructed adjacent to the drainage, reducing the riparian area. The unpaved Forest road constrains the intermittent channel over most of the length. The road has added sediment to the stream, and in some areas, the stream flows over the road. Maxim rated the Wells Canyon drainage as non-functional due to high sediment loads caused by the road (Maxim 2004e). CNF rated the drainage as functioning-at-risk due to road encroachment and sediment loads, and stated that the apparent trend was moderately upward (i.e., improving; USFS 2005a).

South Fork Sage Creek

South Fork Sage Creek was evaluated from the east boundary of the Study Area to its origin at a spring in Sage Meadows. Riparian vegetation consists of dense stands of willows interspersed with sedge meadows on some of the broader stream terraces. Invasive plant species have increased in density on disturbed soils. South Fork Sage Creek was rated functioning-at-risk (Maxim 2004e). The CNF also evaluated the creek as functioning-at-risk in 2005 (USFS 2005a).

Manning Creek

Manning Creek, an ephemeral stream, is a tributary to Crow Creek with a short upper reach of perennial flow due to a spring discharge. The entire channel receives seasonal flow from snowmelt and precipitation, although Manning Creek was dry during monitoring visits between May 2002 and August 2004. Maxim determined Manning Creek to be functioning-at-risk in June 2003 (Maxim 2004e), although their justification for doing so ("due to effects of livestock grazing and trampling") is invalid because the PFC assessment protocol does not include an evaluation of grazing or land use. As part of range inspections in 2005, the CNF evaluated forage vegetation, ground cover, and utilization associated with this drainage, but did not evaluate PFC because Manning Creek was dry.

Mountain Snowberry/Sagebrush

The mountain snowberry/sagebrush cover type is found primarily at higher elevations, where soil moisture is higher than in low-elevation sagebrush stands. The mountain snowberry/ sagebrush cover type occurs on 4.5 percent of the Study Area and is dominated by mountain snowberry and big sagebrush. In certain areas, big sagebrush is absent and young aspen trees are found, indicating that these areas may succeed to forest cover in the absence of disturbance. Other associated shrub species include chokecherry, serviceberry, rose, and snowbrush (*Ceanothus velutinus*, USFS 2003b). Associated grasses and forbs include buckwheat (*Eriogonum* spp.), arrowleaf balsamroot, mules ear (*Wyethia amplexicaulis*), and oniongrass (*Melica bulbosa*).

Forb/Graminoid

The forb/graminoid cover type is present throughout the Study Area, accounting for 1.7 percent of the vegetation. This cover type, dominated by forbs with some grasses and sedges, is found on steep, "shaley" slopes most frequently, but can also be found in more mesic conditions and appear as montane meadows. Common associates include: little larkspur (*Delphinium bicolor*), paintbrush (*Castilleja pilosa var. longispicata*), western wallflower (*Erysimum asperum*), hawksbeard (*Crepis* spp.), lupine (*Lupinus* spp.), mutton grass (*Poa fendleriana*), buckwheat, mules ear, arrowleaf balsamroot, horse-mint (*Agastache urticifolia*), sticky geranium, and California false-hellebore.

Mountain Mahogany

The Mountain mahogany cover type occurs on 0.9 percent of the Study Area on south-facing slopes above Deer Creek with dry, rocky, shallow, limestone soils. Curlleaf mountain mahogany (*Cercocarpus ledifolius*) dominates, forming an open canopy. Other associates include: bluebunch wheatgrass, mountain snowberry, serviceberry, arrowleaf balsamroot, and Oregon grape.

3.5.3 Special Status Plant Species

The US Fish and Wildlife Service (USFWS) does not identify any Threatened, Endangered, Proposed, or Candidate (TEPC) species that are known or expected to occur on the CNF (Species List #1-4-05-SP-0354). In addition to TEPC species, the Regional Forester identifies Sensitive (S) species as those for which population viability is a concern, as evidenced by significant current and predicted downward trends in population numbers, density, and/or habitat capability that would reduce a species' existing distribution. Sensitive species receive special management emphasis from the USFS to ensure their viability and to preclude trends toward endangerment that could result in the need for federal listing (FSM 2672.1). Sensitive species potentially occurring in the Study Area are listed in **Table 3.5-2**. Background information on each species follows the table. Additional information can be found in the RFP EIS (USFS 2003b:Appendix D) and the vegetation baseline report (Maxim 2004e).

TABLE 3.5-2 SENSITIVE SPECIES KNOWN OR SUSPECTED TO OCCUR ON THE CNF

COMMON NAME	SPECIFIC NAME	USFS STATUS
Starveling Milkvetch	*Astragalus jejunus* var. *jejunus*	Sensitive
Payson's Bladderpod	*Lesquerella paysonii*	Sensitive
Cache Penstemon	*Penstemon compactus*	Sensitive

Starveling Milkvetch

In Idaho, starveling milkvetch occurs on knolls, ridges, and other exposures of raw, loose, sparsely vegetated, light-colored shale. It appears to be restricted to bright outcrops of calcareous shale, having a fine to stone-size texture. Starveling milkvetch is found on all aspects, usually on gentle to moderately steep slopes. Idaho populations are found in the southeastern corner of the State, in the southern Preuss Range, Sheep Creek Hills, and Bear Lake Plateau, all in Bear Lake County, all at least 15 miles from the Project Area. While no individuals of this species were observed, suitable habitat for this species may be present on road cuts along the South Fork of Deer Creek or on ridge tops along the west side of the Crow Creek Valley. Approximately 1,340 acres of potential, marginal habitat for starveling milkvetch occur in the Study Area; however, this species appears to be restricted to more exposed shale sites than those observed in the Project Area (Maxim 2004e).

Payson's Bladderpod

Payson's bladderpod occurs most often above 8,000 feet elevation, on ridge tops or south-facing slopes of limestone with gravelly soils and sparse vegetation. The species is endemic to west-central Wyoming and adjacent Idaho, with disjunct populations in southwestern Montana (USFS 2003b:D-186). While Payson's bladderpod was not observed during field investigations, the range of the species includes areas near the Project Area (Maxim 2004e). The nearest occurrence is the nearby Salt River Range in Wyoming, approximately 15 miles southeast of the Project Area.

Cache Penstemon

Cache penstemon is considered endemic to the Bear River Range, located at least 15 miles west-southwest of the Project Area. This species occurs in open, rocky limestone areas in the subalpine zone at 8,800 – 9,300 feet elevation. Idaho populations are reported to occur on carbonate substrates (USFS 2003b:D-188). While this species was not observed during field investigations, some habitat may be present in the Study Area (Maxim 2004e). The most suitable carbonate substrates for this species; however, are not present.

3.5.4 Noxious Weeds

Noxious weed species, as defined in Executive Order 13112 (64 CFR 6183, Invasive Species, February 1999), are those plants of foreign origin, not widely prevalent in the United States, that can injure crops, ecosystems, interests of agriculture, or fish and wildlife resources. They generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, and a carrier or host to insect pests or disease. The State of Idaho is responsible for listing noxious weeds in the State. The State's most current list, created in 2001, lists 36 species of noxious weeds. Six of these species were recorded in the Study Area.

In 1996, the CNF adopted Integrated Pest Management (IPM) guidelines to treat uncontrolled noxious weeds. IPM emphasizes the best management strategies for weed control and uses the best control techniques available for the targeted species. In February 2001, the CTNF completed a forest strategy for noxious weeds developed from direction found in the following documents: National Administration's *Pulling Together – National Strategy of Invasive Plant Management*, Forest Service's *Stemming the Invasive Tide – A Forest Service Strategy for Noxious and Nonnative Invasive Plant Management*, and *Idaho's Strategic Plan for Managing Noxious Weeds*. The RFP (USFS 2003a:3-21) outlines the goal of minimizing the establishment and spread of noxious weeds through the application of Forest direction, IPM, and BMP's. The RFP also established standards and guidelines to be used for controlling and eliminating noxious weeds and other invasive plant species (USFS 2003a:3-22). The Smoky Canyon Mine's weed control program follows guidelines established by the USFS. The mine is inspected on a monthly basis, and Simplot is notified by the USFS of any problems noted, including weed infestations. Simplot responds to these reports by treating weed-infested areas with USFS-approved chemicals.

As reported from CTNF survey results in 2001, noxious weeds infest over 85,000 acres throughout the CTNF. Based on GIS data provided by the CNF, a number of noxious weed infestations occur within the Study Area. **Figure 3.5-2** shows infestations of black henbane (*Hyoscyamus niger*), Canada thistle, Dyer's woad, field bindweed (*Convolvulus arvensis*), musk thistle (*Carduus nutans*), and yellow toadflax (*Linaria vulgaris*). The vegetation baseline studies found three noxious weed species during surveys in 2003 (Maxim 2004e). Black henbane was observed along Crow Creek Road and scattered along the lower portions of Deer Creek and the Manning Creek Road. Canada thistle was found along the riparian corridors of Crow, Deer, and Manning creeks. Dyer's woad was observed along sections of lower Deer Creek, Crow Creek Road, and along the Manning Creek Road. In addition, Simplot has been treating spotted knapweed (*Centaurea biebersteinii*) in the area for the past two years.

3.5.5 Suitable Timber for Harvest

Management prescriptions in the RFP are a set of practices applied to a specific area to attain multiple-use and to provide a basis for consistently displaying management direction on land administered by the CNF. Management Prescription 5.2 (USFS 2003a:4-71, Forest Vegetation Management) pertains to scheduled wood-fiber production, timber growth, and yield while maintaining or restoring forested ecosystem processes and functions to more closely resemble historical ranges of variability with consideration for long-term forest resilience. All forms of timber harvest are permitted, including salvage, to achieve stated goals and objectives. Livestock grazing may be allowed on transitory forage produced following timber harvest where and when that use would not conflict with regeneration and restoration efforts. Motorized use is prevalent for timber management activities and recreation. Land in this prescription is included in the suitable timber base and contributes to the Allowable Sale Quantity.

Tentatively Suitable Forest land is land which is producing or is capable of producing crops of industrial wood and: 1) has not been withdrawn by Congress, the Secretary, or Chief; 2) existing technology and knowledge is available to ensure timber production without irreversible damage to soil, productivity, or watershed conditions; and 3) existing technology and knowledge provides reasonable assurance that adequate restocking can be attained within five years after final harvesting (USFS 2003a). The Panel F and G lease areas, including the lease modification areas of Panel F, encompass a total of 2,040 acres. The lease areas contain 1,610

Figure 3.5-2 Noxious Weeds

acres of tentatively suitable timber. However, only the portion of Panel F that lies within Prescription 5.2 is included in the Allowable Sale Quantity. This portion of Panel F contains 641 acres of tentatively suitable timber (108 acres aspen, 170 acres aspen/conifer, and 363 acres conifer), which is included in the Allowable Sale Quantity (Maxim 2004g).

Management Prescription 5.2 is replaced by Prescription 8.2.2 (Phosphate Mine Areas) following approval of a Mine and Reclamation Plan. Prescription 8.2.2 allows for the exploration and development of existing mine leases.

3.5.6 Selenium Issues with Vegetation

The uptake of selenium and other trace elements by plants is correlated to the availability of those trace elements in the soil. Several studies have investigated selenium uptake in plants on reclaimed phosphate mining areas in Southeastern Idaho. NewFields (2005b) measured the COPC (including selenium) content of terrestrial vegetation across Smoky Canyon Mine Panels A, D, and E, both within and adjacent to mined areas that have been reclaimed. Reclamation in Panels A, D, and the early parts of Panel E did not include selenium control measures (covering) common to current mining practices. Much of the Panel E overburden fills have been covered with chert and topsoil. Mean selenium accumulation in terrestrial vegetation (including browse and forage species) growing on reclaimed overburden fills was 4.42 mg/Kg dry weight (dw), whereas mean selenium accumulation in terrestrial vegetation growing in native soils adjacent to the reclaimed areas was 0.3 mg/Kg dw. JBR (2001a) sampled reclamation vegetation across the same Smoky Canyon Mine Panels collecting forb and grass samples from six different reclamation sites. They found vegetation rooted in unsorted overburden had the highest selenium values, whereas vegetation rooted in topsoil spread over a chert cover had selenium uptake that was comparable to background levels. Mean dry weight concentration of selenium in all vegetation sampled from the reclaimed areas by JBR was 12.11 mg/Kg dw, relative to background levels of 0.25 mg/Kg dw. Alfalfa sampled on five of the treatment areas showed the highest selenium levels (15.3 - 98.0 mg/Kg dw), with the exception of one Sanfoin sample. These values exceed the threshold selenium value for grazing animal forage, established at 5 mg/Kg dw (National Research Council 1980).

At Wooley Valley Mine, approximately 20 miles west of Smoky Canyon Mine, Mackowiak et al. (2004) found that the mean vegetation selenium content from an overburden fill site was 38 mg/Kg dw. Mean selenium values for legume, grass, and tree species growing on the historical Wooley Valley Mine reclamation site were all greater than 5 mg/Kg dw, whereas forb and shrub species growing on the site had lower selenium values. A study where alfalfa was grown in pots showed similar selenium uptake levels as grass species, supporting Stark and Redente's (1990) theory that alfalfa's ability to uptake trace elements from oil-shale deposits was due to its deeper root penetration. Mackowiak et al. (2004) suggested that substituting native shrub and forb species for alfalfa may lessen the risk of selenium toxicosis in livestock and wildlife. Alfalfa and sainfoin are no longer used in reclamation seed mixes for phosphate mines in Southeastern Idaho on USFS system lands.

When seleniferous overburden material lies beneath topsoil and a layer of low-selenium chert, selenium uptake would largely depend on the ability of roots to penetrate these upper layers and make contact with the overburden. Nobel (1991) compared the root characteristics of various groups of vegetation and found that winter annuals and perennial grasses generally had maximum root depths of less than three feet. Native trees and shrubs, if reestablished through either reclamation or natural colonization, would have greater root penetration. Of the common tree species found in the Project Area, reports could be found for subalpine fir, lodgepole pine, Douglas-fir, and quaking aspen (Stone and Kalisz 1991). Douglas-fir maximum root depths were reported from five studies (12.1, greater than 10.5, 4.9, 9.8, and approximately 32.8 feet). Subalpine fir maximum root depths were reported from two studies (4.9 and greater than 13 feet). Lodgepole pine maximum root depths were reported from three studies (greater than 3.3, greater than 6.6, and greater than 10.8 feet), and quaking aspen maximum rooting depths were reported from six studies (4.9, 7.5, greater than 9.8, 4.9, greater than 9.8, and greater than 5.9 feet). In a survey of reported maximum rooting depths of 253 herbaceous and woody plants, Canadell et al. (1996) found that the mean maximum root depths of herbaceous plants, shrubs, and trees were 8.5, 16.7, and 23.0 feet, respectively.

Within the last several years, Simplot has begun using a cover design that includes eight feet of chert and one to two feet of topsoil for all seleniferous overburden reclamation activities at the existing Smoky Canyon Mine. Sampling reclamation vegetation growing on these covered areas has demonstrated a lack of selenium accumulation in the vegetation compared to areas where reclamation vegetation is growing directly on top of seleniferous overburden (JBR 2001a; NewFields 2005b). Although sampled vegetation growing on covered areas is young, it is not expected to accumulate selenium over time as roots grow deeper. Vegetation growing on covered areas will continue to be sampled as part of the CERCLA process for the Smoky Canyon Mine.

3.6 Wetlands

Wetland resources in the Project Area and along proposed haul/access road and conveyor corridors were surveyed by Maxim Technologies, Inc. (Maxim) in 2003 and 2004. The Maxim surveys identified potentially jurisdictional wetlands and Waters of the U.S. (WOUS or WUS as used in Maxim baseline reports for “non-wetland waters’) within areas that may be affected by the Proposed Action and Alternatives (**Figure 3.6-1**). The results of these surveys are presented in several reports addressing various phases of the Proposed Action and Alternatives (Maxim 2003b; 2004h; 2004i). Data from these reports are summarized below.

Waters of the U.S. include channels that show evidence of conveying flowing water on at least an average annual basis and have the presence of a defined bed and banks. Concerning RFP Standards and Guidelines for wetlands and aquatic resources (USFS 2003a:3-16), direction is provided in Prescription 2.8.3 (USFS 2003a:4-45 to 4-53). This prescription applies to the Aquatic Influence Zone (AIZ) associated with lakes, reservoirs, ponds, streams, and wetlands. Default AIZ widths for wetlands include: 1) for wetlands greater than 1 acre, the AIZ would consist of an area 150 feet slope distance from the maximum pool elevation of the wetland, and 2) for wetlands less than 1 acre, the AIZ would consist of an area 50 feet slope distance from the edges of the wetland. Within the Study Area, there are approximately 1,225 acres of AIZs that are associated with perennial and intermittent streams (fish-bearing and non-fish-bearing) and identified wetlands.

Maxim further identified channels as ephemeral, intermittent, and perennial. Ephemeral channels flow only during periods of snow melt or intense precipitation events. Intermittent channels support surface flow for only a portion of the year. Flow in these channels occurs as a result of snow melt, precipitation events, and in part as a result of seasonal groundwater discharge. Perennial channels flow year round, with flow supported by continuous groundwater discharge.

Figure 3.6-1 Wetlands

Some channels may be ephemeral or intermittent in their upper reaches and perennial in some (usually lower) reaches. Channels were examined for evidence of an average annual flow. In particular, channels were examined for evidence of an ordinary high water mark (OHWM). Channels exhibiting evidence of an OHWM and that share a connection to interstate waters or waters used in interstate commerce are generally identified as WOUS.

Potential wetland areas were evaluated using the methodology specified in the USACE's Wetland Delineation Manual ("Manual") for conducting routine onsite wetland delineations (USACE 1987). The vegetation, soils, and hydrology were examined at potential wetland sites. As described in the Manual, potentially jurisdictional wetlands must meet specific vegetation, soils, and hydrology criteria. Waters of the U.S., including wetlands, that may be used in interstate commerce are identified as jurisdictional waters under the Clean Water Act (CWA).

Dredge and fill activities within jurisdictional areas are regulated by the USACE. If wetlands are present adjacent to a WOUS, USACE jurisdiction extends beyond the OHWM of the waters to the limit of the adjacent wetlands. Wetlands located along Crow Creek were identified based on National Wetland Inventory (NWI) maps. Maxim did not field-verify the majority of these NWI-mapped wetlands along Crow Creek due to access restrictions. The boundaries of these wetlands as taken from the NWI maps may not be completely accurate.

3.6.1 SWANCC Decision

The USACE regulates dredge and fill activities in WOUS (including wetlands) under Section 404 of the Clean Water Act. Waters of the U.S. include navigable waters and their tributaries, including adjacent wetlands; interstate waters and their tributaries, including adjacent wetlands; and all other WOUS "such as isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not a part of a tributary system to interstate waters or navigable WOUS, the degradation or destruction of which could affect interstate commerce" (Federal Register 1982). On January 9, 2001, the U.S. Supreme Court ruled in the Solid Waste Agency of Northern Cook County (SWANCC) case that the USACE cannot invoke migratory bird use as the sole basis under which the USACE may assume jurisdiction over certain isolated WOUS, including isolated wetlands (Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, No. 99-1178). Prior to this Supreme Court ruling, the USACE considered migratory bird use of isolated wetlands to be a tie to interstate or foreign commerce. As a result of the SWANCC decision, the rationale for USACE's jurisdictional determinations has changed. The USACE may now require the presence of a defined channel/bed and bank connection to known interstate waters or to waters with a clear tie to interstate commerce before taking jurisdiction. Several isolated, non-jurisdictional wetlands were identified within the Project Area.

3.6.2 Wetland Functions and Values

Wetland functions and values were assessed and rated using the methods developed for the Montana Department of Transportation (MDT) (Berglund 1999). Wetland functions include wildlife and fish habitat (including habitat for listed and/or sensitive species and for general wildlife and fish habitat), flood attenuation, long- and short-term water storage, sediment and nutrient retention and removal, sediment and shoreline stabilization, production export and food chain support, and groundwater recharge and discharge. Wetland values include uniqueness and recreational and educational potential. Parameters which include both function and value include habitat for federally listed, proposed, and candidate plants and animals and habitat for animals and plants receiving special status from state agencies.

Wetlands are assessed and assigned a functions and values rating for each of twelve functions and values categories. Functions and values points are then summed and expressed as a function of the possible total. Functions that do not apply are not included in the point total. This percentage is then used to rank the functions and values of the wetland in one of four categories, with Category I the highest ranking and Category IV the lowest. Category I wetlands include rare, unique, and/or pristine wetland systems; Category IV wetlands represent severely degraded systems. The wetlands functions and values rating, multiplied by the area of the wetland, also provides a measure of "Wetlands Functional Units." Functions and values for each delineated wetland are available in Maxim 2003b, 2004h, and 2004i and a summary of functional unit score of wetlands by Study Area location is shown in **Table 3.6-1**.

3.6.3 Wetland Types

The Maxim delineations also classified wetlands found in the area by Hydrogeomorphic (HGM) type (Brinson 1993) and classified wetlands according to the USFWS's Wetland Classification System (Cowardin et al. 1979). The HGM classification categorizes wetlands based on the abiotic features that maintain wetland ecosystem function, such as hydrologic and geomorphic controls (Maxim 2003b). The USFWS Cowardin system categorizes wetlands based on vegetative cover and the role vegetation plays in the structure and function of wetlands. Common Cowardin wetland types in the Project Area include palustrine emergent (PEM) wetlands, which include wetted areas with emergent vegetation and wet meadows; and palustrine scrub-shrub (PSS) wetlands, which include willow stands.

3.6.4 Findings on Extent and Jurisdictional Status of Wetlands

The findings discussed below represent Maxim's evaluation of the extent and jurisdictional status of wetlands and WOUS found in the Study Area. As displayed in **Figure 3.6-1**, numerous wetlands were identified throughout the area. No delineation becomes official until it has been verified by the USACE. The USACE conducted a field verification of the Panel F and Panel G delineation, including the areas of the proposed North and South Lease Modifications. With the exception of a single wetland area in the Panel F South Lease Modification Area, the Corps concurred with Maxim's 2003 findings (USACE 2003). The USACE also conducted a field verification for a delineation on potential haul roads and Crow Creek Road (Maxim 2004h) and concurred with the findings, but the USACE has not yet verified the findings in the Maxim (2004i) delineation, an addendum report to Maxim (2004h).

Accordingly, the figures for jurisdictional extent of wetlands and WOUS found in these portions of the survey area may change. Further, because mining in Panel G may not begin for a number of years, the USACE has determined a verification of the extent of wetlands and WOUS in the Panel G area would occur at a later date.

Panel F Lease Area

Maxim (2003b) identified two ephemeral stream reaches within the Panel F lease area (**Figure 3.6-1**). One of these reaches is on Manning Creek, in the southern portion of the proposed lease area. The second is an unnamed ephemeral tributary to the South Fork of Sage Creek located in the northern and central portions of the Panel F lease area. This ephemeral tributary drains the majority of the proposed Panel F lease area north of the Manning Creek watershed. While channel definition in the lower end of this unnamed tributary to the South Fork of Sage Creek is lost, Maxim indicated a groundwater connection exists between this tributary and the

South Fork of Sage Creek. Accordingly, Maxim identified both of these channels as potentially jurisdictional features. The delineation also identified three small wetland areas within the Panel F lease area (**Figure 3.6-1**). One of these wetlands is located at the head of Manning Creek, and the second is adjacent to the unnamed tributary to the South Fork of Sage Creek. Both of these wetlands are considered to share a connection with interstate waters (Manning Creek is directly tributary to Crow Creek, while the unnamed channel is tributary to the South Fork then the main fork of Sage Creek). These sites were identified as potentially jurisdictional wetlands. A third small wetland area is isolated and was identified as a non-jurisdictional site. The two potentially jurisdictional wetlands include a total area of approximately 0.05 acre and a combined Functional Unit score (the functions and values rating multiplied by the acreage of the wetland) of 0.133. Both of these wetlands are developed springs, and are identified as PEM wetlands. The isolated and non-jurisdictional wetland is approximately 0.07 acre in size and was given a Functional Unit score of 0.330. This site is identified as a fen (an area of peat that is fed by groundwater) and as a PEM wetland.

Panel F, South Lease Modification Area

Maxim (2003b) identified two unnamed tributaries to the North Fork of Deer Creek as being within the Panel F South Modification Lease Area. These two tributaries drain southwest from the lease modification area. Both are ephemeral within the lease modification area. Based on evidence of a groundwater connection to the perennial North Fork of Deer Creek, both these channels were identified as potentially jurisdictional WOUS (**Figure 3.6-1**). A total of 14 wetland areas within the Panel F South Lease Modification Area were also identified. The Maxim delineation and subsequent USACE verification identified all but one of these wetlands as jurisdictional features. The majority of wetlands present within the Panel F South Modification Lease Area were identified as riverine features on ephemeral channels. Twelve of these wetlands were identified as Palustrine Scrub-Shrub PSS wetland features; one was identified as a fen/PEM wetland. The thirteen jurisdictional wetlands include a total area of approximately 0.84 acre and a combined Functional Unit score of 3.57. The single isolated and non-jurisdictional wetland is approximately 0.02 acre in size and was given a Functional Unit score of 0.090. This site was identified as a fen, and as a PEM wetland.

Panel F, North Lease Modification Area

An intermittent reach of the South Fork of Sage Creek passes through the Panel F North Lease Modification Area. Maxim (2003b) identified this intermittent reach of the South Fork of Sage Creek as a potentially jurisdictional channel (**Figure 3.6-1**). Maxim (2003b) also identified a portion of the ephemeral unnamed tributary to the South Fork of Sage Creek as being within the Panel F North Lease Modification Area and a potentially jurisdictional WOUS. Three wetland areas were identified within or partially within the Panel F North Lease Modification Area. Two of these sites are located on and adjacent to the South Fork of Sage Creek, and both were identified as potentially jurisdictional features. A small isolated wetland area was identified as non-jurisdictional. The two jurisdictional wetlands include a total area of approximately 3.00 acres and were given a Functional Unit score of approximately 27.6. The isolated and non-jurisdictional wetland is 0.01 acre in size and was given a Functional Unit score of 0.130. All three of these wetlands were identified as riverine/slope/PEM wetlands.

Panel G Lease Area

Maxim (2003b) identified two ephemeral drainages within the Panel G lease area. These drainages are the South Fork of Deer Creek and an unnamed tributary to this named drainage. The unnamed tributary includes two forks in its upper reaches. Maxim (2003b) identified both of these drainages, including both forks of the unnamed drainage, as potentially jurisdictional WOUS (**Figure 3.6-1**).

Maxim (2003b) also identified six wetland areas within the Panel G lease area (**Figure 3.6-1**). Five of these six wetlands were identified as riverine features/PSS wetlands adjacent to the South Fork of Deer Creek or its unnamed tributary. These five features were identified as potentially jurisdictional. The sixth wetland was identified as an isolated, non-jurisdictional feature, located south of the South Fork of Deer Creek. The five jurisdictional wetlands, all identified as riverine systems on ephemeral streams, include approximately 0.40 acre and a combined Functional Unit score of 1.513 for the area of potentially jurisdictional wetlands. The single isolated wetland is 0.34 acre in size and received a Functional Unit score of 1.700. This wetland was identified as a fen/PEM wetland.

TABLE 3.6-1 WETLAND AREA AND FUNCTIONAL UNIT SCORE

STUDY AREA LOCATION	WETLAND AREA	FUNCTIONAL UNIT SCORE
Panel F (on lease)	0.05 acre (+ 0.07 acre non-jurisdictional)	0.133 (0.330)
Panel F South Lease Modification	0.84 acre (+ 0.02 acre non-jurisdictional)	3.570 (0.090)
Panel F North Lease Modification	3.00 acres (+ 0.01 acre non-jurisdictional)	27.600 (0.130)
Panel F Haul/Access Road	0.00 acre	N/A
Panel G (on lease)	0.40 acre (+ 0.34 acre non-jurisdictional)	1.480 (1.700)
Panel G West Haul/Access Road	2.09 acres	17.650
Middle Haul Road and Middle Access Road Corridor	0.31 acre	2.660
East Haul/Access Road	0.86 acre	7.400
Modified East Haul/Access Road	0.85 acre	7.310
Crow Creek-Wells Canyon Access Road	2.16 acres	18.580

3.6.5 Haul/Access Roads and Conveyor Corridors

A delineation of wetlands and WOUS that occur within potential haul/access road corridors was also conducted (Maxim 2004h and 2004i). Wetlands and WOUS in the area of a potential utility corridor between Panels F and G were identified in the original Deer and Manning Creek Lease Area delineation (Maxim 2003b). A potential conveyor and power line corridor between Panels F and G were located within this Potential Utility Corridor Area. A summary of the findings for the corridors is summarized below.

Panel F Haul/Access Road and Alternate Corridor
This corridor crosses a defined, ephemeral reach of the South Fork of Sage Creek (**Figure 3.6-1**). The Alternate corridor for the haul/access road crosses the defined, but non-perennial reach of the South Fork Sage Creek and crosses one undefined tributary at two locations.

Panel G West Haul/Access Road and Alternate Corridors

The West Haul Road would cross the upper reaches of Deer Creek and the South Fork of Deer Creek, both of which are identified as Waters of the U.S. (**Figure 3.6-1**). Maxim (2004h and 2004i) identified a fen-marsh complex/PEM-PSS wetland in the upper reaches of South Fork Deer Creek at the confluence of two tributaries. A riverine/PSS wetland also occurs along Deer Creek. As the corridor gradually turns toward the northeast, then north, an area of PSS wetland and an unnamed tributary channel located above the upper reaches of Deer Creek occur within the corridor. The corridor would either follow the upper reaches of the South Fork of Sage Creek to the northern end of the Panel F Lease Area (Proposed Action), or, alternately (Transportation Alternative 5), turn south above the upper reaches of the North Fork of Deer Creek and enter the Panel F South Lease Modification Area. A small wetland area was identified at the headwaters of the South Fork of Sage Creek in Sage Meadows. The delineation did not include the majority of the Sage Meadows area, because potential haul road access corridors are outside the area. A total of seven jurisdictional wetlands occur within the West Haul/Access Road and Alternate Corridors, including a total of 2.09 acres and a Functional Unit score of 17.65.

Middle Haul Road and Middle Access Road Corridor

The Middle Haul/Access Road corridor crosses a defined, but non-perennial reach of Deer Creek north of Panel G. Maxim (2003b) indicates this reach of stream is just above a large riverine/PSS wetland complex (**Figure 3.6-1**). The Middle Access Road corridor would cross a narrow section of this wetland complex. At its northern end, the corridor crosses a small wetland located at the head of a tributary to the North Fork of Deer Creek. The corridor also crosses five undefined channels (Maxim 2004i) situated between the main channel of Deer Creek and the headwaters of the North Fork of Deer Creek. A total of two jurisdictional wetlands occur within the Middle Haul Road and Middle Access Road Corridor, including a total of 0.31 acre and a Functional Unit score of 2.66.

East Haul/Access Road

From south to north, this corridor crosses an undefined tributary to Wells Creek east of the southern portion of Panel G and then turns east and crosses an undefined channel in Nate Canyon. This corridor would then cross a jurisdictional, 0.86-acre wetland complex, identified as a riverine/PSS-PEM wetland, associated with the lower reaches of Deer Creek just west of Crow Creek Road (**Figure 3.6-1**). This wetland received a Functional Unit score of 7.40. North of Deer Creek, this corridor would cross six undefined drainages, including the undefined Manning Creek channel. The corridor would also cross a non-perennial channel east of the northern end of Panel F and a defined but non-perennial reach of the South Fork of Sage Creek in the same corridor as the Panel F Haul/Access Road corridor.

A Modified East Haul Road alignment would cross Deer Creek higher in the drainage (above the East Haul/Access Road corridor). This alignment would cross a jurisdictional, 0.85-acre riverine/PSS-PEM wetlands complex adjacent to the Deer Creek channel at the crossing location (**Figure 3.6-1**). This wetland received a Functional Unit score of 7.31.

Crow Creek-Wells Canyon Access Road

The Crow Creek-Wells Canyon access road would generally follow the existing Crow Creek Road. A proposed access road corridor has been identified north of Wells Creek and would access the southern boundary of Panel G.

Maxim (2004h and 2004i) identifies eight WOUS crossings and approximately 20 jurisdictional wetland areas along Crow Creek that may occur within the Crow Creek Road corridor (**Figure 3.6-1**). From south to north, the eight WOUS (non-wetland waters) crossings identified in Maxim, 2004h are: a ditch north of Wells Canyon; Deer Creek; Quakie Hollow; Sage Creek; an unnamed tributary to Crow Creek; Herdmane Hollow; a second unnamed tributary to Crow Creek; and possibly a reach of Crow Creek. Wetlands that occur along the potential Crow Creek-Wells Canyon Access Road include primarily riverine/PSS and PEM wetlands along Crow Creek and its tributaries. The twenty wetlands that occur within the Crow Creek-Wells Canyon Access Road Corridor include a total of 2.16 acres and a Functional Unit score of 18.58.

3.7 Wildlife Resources

The CNF, its uses, and resources are managed with the guidance of the RFP (USFS 2003a). The Desired Future Conditions (DFC) and objectives for wildlife resources are achieved by using the forest-wide standards and guidelines and the standards and guidelines for the Biological Elements section as set forth in the Management Prescriptions of the RFP. Forest Plans provide for viability of vertebrate communities within multiple use objectives. The CNF uses the planning process and ongoing monitoring, evaluation, and adjustment of fish, wildlife, and rare plant standards to prevent listing of species under the Endangered Species Act and to avoid extirpation of species by its actions (USFS 2003a).

The RFP lists specific standards and guidelines with regard to wildlife for phosphate mine areas under Prescription 8.2.2 (g) (USFS 2003a:4-84). The standard listed pertains to snag habitat for woodpeckers and is discussed below under the appropriate species. One guideline listed pertains to big game migration (discussed below); three general guidelines listed for wildlife pertain to reclamation. General guidelines state that 1) reclamation be designed to minimize wildlife exposure to hazardous substances, 2) reclamation be designed to use species that contribute to wildlife habitat needs, and 3) construction of ledges on highwalls be encouraged to accommodate cliff-dwelling species (discussed below under the appropriate species).

Maxim conducted a baseline assessment of wildlife resources within the Study Area during 2003. These studies provide baseline data on wildlife resources that might be influenced by any of the action alternatives. A baseline technical report was prepared and provides details on Maxim's methodologies, results, and conclusions (see Maxim 2004j). The following is largely summarized from this report. Additional pertinent information is also included and cited appropriately.

The dominant vegetation types in the Study Area are forest, sagebrush, and riparian communities, and are discussed in detail in **Section 3.5** of this document. In summary, the dominant forested habitats are aspen and subalpine fir types. Other forest communities include aspen/conifer, Douglas-fir, and in some cases, mountain mahogany. Aspen is the most productive forest community type on the CNF in terms of wildlife diversity and herbaceous cover (USFS 2003b) as it provides areas for big game calving, browse and foraging areas for a variety of wildlife, nesting areas for arboreal bird species, and security areas. The sagebrush community is dominated by mountain big sagebrush and various forbs and grasses. Rangeland communities, including sagebrush, provide a wide array of habitats for wildlife species found on the CNF. Wetlands and/or riparian habitats occur along Crow Creek, Deer Creek, South Fork Sage Creek, and in Wells Canyon. Of the 334 avian, terrestrial, and amphibian species known or suspected to occur on the CNF, 277 are either directly dependent on riparian areas or use riparian habitats at some time during their lives (USFS 2003b). Other non-forest communities include wet meadow, forb/graminoid, and mountain snowberry/sagebrush.

Wildlife groups are discussed below, including Threatened, Endangered, Proposed, and Candidate (TEPC) species; Management Indicator Species (MIS); Sensitive (S) species; migratory land birds and other mammals, birds, amphibians, and reptiles. MIS have changed since the original CNF Forest Plan; changes to this list of species can be found in the CNF RFP (USFS 2003a) and are incorporated in the MIS section below (see **Table 3.7-4**).

3.7.1 Threatened, Endangered, Proposed, and Candidate Wildlife Species

The US Fish and Wildlife Service (USFWS) identified four TEPC species that are known or expected to occur on the CNF (Species List #1-4-05-SP-0354). These species are listed in **Table 3.7-1**; background information on each species follows the table. Additional information can be found in USFS (2003b:Appendix D) and Maxim (2004j).

TABLE 3.7-1 THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE WILDLIFE SPECIES KNOWN OR SUSPECTED TO OCCUR ON THE CARIBOU NATIONAL FOREST

COMMON NAME	SPECIFIC NAME	USFWS STATUS
Gray Wolf	*Canis lupus*	Endangered[1]
Canada Lynx	*Lynx canadensis*	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Western Yellow-Billed Cuckoo	*Coccyzus americanus*	Candidate

[1]Population in/near Project Area is considered experimental/nonessential

Gray Wolf

Prior to European colonization, the wolf occupied most habitats in the northern hemisphere. Predator control and other persecution have reduced the wolf's range to Canada, Alaska, and portions of the northern tier of the continental United States. Recently, wolves have been reintroduced into some portions of their former range. In 1995, in an attempt to reintroduce wolves into the Yellowstone area, the USFWS began releasing wolves captured in Canada into Yellowstone National Park. Similar reintroductions were attempted in central Idaho. The reintroduced wolves have increased in numbers, and animals have dispersed into some surrounding areas. The populations established by this release effort are considered experimental, nonessential populations. In Idaho, all wolves south of Highway I-90, which runs through the Idaho Panhandle approximately 400 miles north of the Project Area, are also considered part of an experimental, nonessential population. Wolves east of Interstate 15, which runs through McCammon, Pocatello, and Idaho Falls, and passes approximately 56 miles west of the Project Area, are considered part of the Yellowstone experimental, nonessential population.

Wolves are sociable animals, frequently traveling and hunting in packs. Prey species preferred by wolves include deer, elk, moose, and beaver. Wolves require habitat suitable for denning (i.e., areas with sufficient vegetative cover and isolation from human interests/uses), and “rendezvous sites” for resting and gathering (i.e., meadows adjacent to forested areas). Any habitat in the Study Area could provide movement routes for wolves. Standards associated with wolf habitat (USFS 2003a:3-30) restrict disturbances within one mile of an active den or rendezvous site. Throughout the year, wolves also require accessibility to prey species (i.e., within the ranges of ungulates year-round, and riparian zones for beaver in spring, summer, and fall). Within the ranges of ungulates and their calving grounds, wolves need relatively large spaces in which to hunt.

In recent years, wolves have been reported in the Caribou County area. In late fall of 2000, a wolf which had been preying on sheep in Caribou County was killed under a taking provision authorized by USFWS (USFWS 2000). Track surveys conducted in the area of sheep kills indicated a single wolf was involved in these predations. This wolf probably dispersed from one of the Yellowstone packs. The closest known wolf pack is located north of Jackson, Wyoming, 70 miles northeast of the Project Area (USFWS et al. 2006). During May 2002, Maxim personnel documented wolf tracks near the confluence of South Fork Deer and Deer Creeks. Wolf tracks were observed in the spring of 2003 approximately ¼ mile west of the confluence of Deer and North Fork Deer Creeks. Though suitable habitat and prey are present, wolves are likely transients in the Study Area, as resident occurrence has not been documented.

Canada Lynx

The Canada lynx is a predator of the northern boreal forests of Canada, Alaska, and the Rocky Mountains and north Cascades. Preferred habitats include boreal forests with openings, bogs, and thickets; old growth taiga; mixed or deciduous forest and wooded step. Early successional stands with high shrub and seedling densities are optimal habitat for snowshoe hare (*Lepus americanus*), the major prey species, and are therefore important to the lynx. Denning occurs in mature forest stands, which also provide important cover and travel corridors (Koehler and Brittell 1990).

It has been determined that suitable lynx habitat on the CNF is too patchy and disjunct to provide suitable resident lynx habitat. Accordingly, it was determined that no Lynx Analysis Units would be identified on the CNF. Habitat on the CNF may however, provide linkage habitat for lynx. Such habitat is used during lynx movement, including dispersal. According to Ruediger et al. (2000), lynx habitats in the Rocky Mountains often occur as “islands of coniferous forest surrounded by shrub-steppe habitats.” Lynx movement between these forested habitats is poorly understood, but use of shrub-steppe habitats adjacent to boreal forests has been documented. In the broad sense, connectivity between lynx habitats in Canada and the U.S. may be necessary for the persistence of some southern lynx populations. These southern populations, if isolated, may be too small to maintain themselves over the long term.

Maxim conducted winter track surveys in the Project Area and found no evidence of lynx (Maxim 2004j). Two unconfirmed lynx were reportedly taken in the area in the 1960s, and an unconfirmed sighting occurred in 1997. A lynx died a few years ago on the Wyoming Range, 50 miles northeast of the Project Area (USFS 2005b).

Standards and guidelines for lynx include desired future conditions, goals, and standards for vegetation (Goals 1-4 and 7, Standard 2), goals for wildlife (Goals 2, 3, and 5), and objectives and standards for lands (Objective 1, Standard 1). These standards and guidelines relate to the maintenance of suitable linkage habitat connectivity for lynx. Vegetation Standard 2 (USFS 2003a:3-20), the most specific prescription, states that in each 5^{th} code forested HUC, the combination of mature and old age classes shall be at least 20 percent of the forested acres and that at least 15 percent of all forested acres in the HUC are to meet or be actively managed to attain old growth characteristics.

Bald Eagle
During the breeding season, bald eagles are closely associated with water and occur along coasts, lakeshores, or riverbanks, where they feed primarily on fish. Bald eagles typically nest in large trees, primarily cottonwoods (*Populus* sp.) and conifers, although they have also been known to nest on projections or ledges of cliff faces. During winter, bald eagles concentrate wherever food is available. Areas of open water, where fish and waterfowl can be taken, are common wintering sites (USFWS 1998).

The CNF mid-winter bald eagle survey results from 1986 to 2005 (USFS 2003c, 2004a, and 2005c) document bald eagle use of the Crow Creek drainage in winter. An annual, one-day snowmobile survey is performed in January along Crow Creek Road from the Caribou/Bear County boundary to Poison Creek near the Idaho–Wyoming border (survey route number 48). This route includes the portion of the Study Area encompassing the Crow Creek drainage. During the 2003 survey, an adult bald eagle was observed in the Study Area on a perch near the confluence of Rock and Crow Creeks (Maxim 2004j). Results from the 2004 midwinter survey showed two eagles, one flying north above the creek between Manning Creek and the CNF boundary, the other in an aspen tree at the Sage Creek/Deer Creek confluence (USFS 2004a). During the 2005 midwinter survey, one juvenile bald eagle was observed from Crow Creek Road flying up Sage Creek (USFS 2005c). The nearest confirmed bald eagle nest is located near the Blackfoot River, approximately 20 miles northwest of the Project Area (JBR 2004d). Nests are also known to occur along the Snake River (greater than 60 miles northwest of the Project Area), around Palisade Reservoir (greater than 30 miles north of the Project Area; USFS et al. 2005), and around Thayne, Wyoming (20 miles northeast of the Project Area).

Standards and Guidelines for occupied nesting zones, primary use areas, and home ranges stated in the RFP (USFS 2003a:3-28 and 3-29) do not apply because there is no nest within 2.5 miles of the Project Area. Guidelines related to minimizing conflicts with bald eagle winter foraging habitat, roosting habitat, and power lines would apply.

Western Yellow-Billed Cuckoo
Western yellow-billed cuckoos breed in large blocks (greater than 20 acres) of riparian habitat, typically woodlands with cottonwoods and willows. No areas of potential habitat have been identified on the CNF (USFS 2003b:3-212) or in the Study Area. Thus, the species will not be discussed further in this EIS.

3.7.2 Sensitive Wildlife Species

In addition to TEPC and MIS species, the Regional Forester identifies Sensitive species as those for which population viability is a concern, as evidenced by significant current and predicted downward trends in population numbers, density, and/or habitat capability that would reduce a species' existing distribution. Sensitive species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that could result in the need for federal listing (FSM 2672.1). Sensitive species potentially occurring in the Study Area are listed in **Table 3.7-2**, followed by background information on each species. Additional information can be found in USFS (2003b:Appendix D) and Maxim (2004j).

TABLE 3.7-2 USFS SENSITIVE WILDLIFE SPECIES KNOWN OR SUSPECTED TO OCCUR ON THE CARIBOU NATIONAL FOREST

COMMON NAME	SPECIFIC NAME
Pygmy Rabbit	*Brachylagus idahoensis*
Spotted Bat	*Euderma maculatum*
Wolverine	*Gulo gulo*
Townsend's Big-Eared Bat	*Corynorhinus townsendii*
Boreal Owl	*Aegolius funereus*
Greater Sage-Grouse	*Centrocercus urophasianus*
Trumpeter Swan	*Cygnus buccinator*
Peregrine Falcon	*Falco peregrinus*
Harlequin Duck	*Histrionicus histrionicus*
Flammulated Owl	*Otus flammeolus*
Northern Three-Toed Woodpecker	*Picoides tridactylus*
Great Gray Owl	*Strix nebulosa*
Columbian Sharp-Tailed Grouse	*Tympanuchus phasianellus columbianus*
Northern Goshawk	*Accipiter gentiles*
Columbia Spotted Frog	*Rana luteiventris*

Pygmy Rabbit

There are no known occurrences of the pygmy rabbit on the CNF (USFS 2003b:D-155) and it is not expected to occur within the Study Area due to the lack of suitable habitat (i.e., dense sagebrush and soft/friable soils). This species will not be discussed further in the EIS.

Spotted Bat

The spotted bat occurs in a variety of habitats from desert to montane coniferous forest, including pinyon-juniper woodlands, ponderosa pine, open pasture, and coniferous forest up to 8,000 feet elevation. These bats roost in deep rock crevices in canyon walls and cliffs and rarely inhabit caves. Forage areas are primarily over dry, open coniferous forest often associated with riparian or wet meadows (Maxim 2004j).

In Idaho, the spotted bat occurs primarily in the southwest corner of the State. The first specimen collected in Idaho was found in Canyon County (IMNH 2001), and the species has only recently been documented in the canyons of Owyhee County (Groves et al. 1997). Populations are also known to occur in the northeast portion of the Greater Yellowstone Area in Montana and Wyoming. Maxim's 2003 and past surveys on the CNF have not documented the presence of spotted bat (USFS 2003b:3-214). Unique rock outcroppings or steep cliff faces are found scattered across the CNF at limited locations. Suitability of any cliff structure in the Project Area as roosting habitat is not known, but use by spotted bats is not expected.

Under Prescription 8.2.2 (g) in the RFP, a guideline for wildlife states that the construction of ledges on suitable highwalls be encouraged to accommodate cliff-dwelling species such as spotted bat.

Wolverine

Wolverines inhabit a wide variety of habitats, though they are usually associated with remote montane-forested areas. Hornocker and Hash (1981) reported that wolverines preferred mature forests, followed by ecotones and rocky areas on timbered benches. Wolverines were most often observed in medium to scattered timber, usually subalpine fir. Wolverines appeared to avoid clearcuts, dense young stands of timber, recent burns, and wet meadows. They are vulnerable to trapping and other human activities.

The Predator Conservation Alliance (2003) estimates that up to 300 wolverines persist in Idaho, based on research and sightings in mountainous portions of the state. Records from Wyoming are from the western third of the State, and there is some evidence that their range has expanded into the southwestern part of the State (Banci 1994). The USFS verified two wolverine tracks located within the CNF at the following locations: 1) approximately 25 to 30 miles north-northwest of the Project Area in the vicinity of Caribou Mountain on the north end of the Caribou portion of the Forest and 2) along the divide between Mink Creek and Liberty Creek in the Bear River Range (Maxim 2004j). Unverifiable ("probable") wolverine tracks were located by USFS six miles southwest of the Project Area. The Idaho Conservation Data Center (CDC) lists one wolverine sighting in 1977, approximately 5 miles north of the Project Area. Wolverine tracks have also been documented within the Ballard Mine site boundary on private land (Greystone 2006) approximately 20 miles west/northwest of the Project Area. No evidence of wolverines was observed by Maxim in 2003. Wolverine occurrence is unlikely though possible, as potential denning habitat (subalpine fir) and prey base exist within and in the vicinity of the Project Area.

Townsend's Big-Eared Bat

The Townsend's big-eared bat occurs in much of western North America and is rare or uncommon throughout much of its range. Townsend's big-eared bats occur in a variety of habitats from desert shrub to deciduous and coniferous forest over a wide range of elevations. During the summer, these bats roost in abandoned mines, caves, and occasionally in empty or occupied buildings or bridges. Research in California found two females roosting in tree cavities, which may be an important undocumented source of maternity colonies (IMNH 2001). Maternity colonies and winter hibernacula occur in mines and caves where the species hibernates singularly or in small groups. Townsend's big-eared bats forage near the foliage of trees and shrubs, and individuals have a high degree of site fidelity (Maxim 2004j).

In Idaho, hibernacula for Townsend's big-eared bats have been found in 17 counties, and four maternity colonies have been found in Boundary, Bonner, and Butte counties (IMNH 2001). There are known populations of the species in Yellowstone and Grand Teton National Parks, approximately 75 miles northeast of CNF, and at Craters of the Moon National Park approximately 125 miles northwest (Clark et al. 1989). Although the Townsend's big-eared bat was not detected within the Study Area (Maxim 2004j), past surveys on the CNF have found the species in the Bear River Range, Pruess Range, Portneuf Range, and Elkhorn Mountains (USFS 2003b:3-214). Although no caves were observed during Maxim's surveys, a single cave was observed by JBR in the South Fork Deer Creek drainage, and it is possible that other caves exist in the Study Area. However, the possibility of roost and hibernacula sites for the Townsend's big-eared bat is low.

Boreal Owl

Boreal owls are typically found in mature to old-growth spruce-fir forests in the Rocky Mountains. They often nest in abandoned northern flicker (*Colaptes auratus*) and pileated woodpecker (*Dryocopus pileatus*) cavities in large dead or dying conifers or aspens within mixed conifer forests. Use of lodgepole pine is infrequent in most areas. Boreal owl roosting and foraging habitat occurs in relatively closed canopy subalpine fir and Engelmann spruce forests. In summer, owls select cool microsites with a high canopy coverage, high basal area, and high tree density. In winter, these owls use a wider variety of habitats due to reduced thermal stress. Foraging occurs year-round primarily in moderately dense stands of subalpine fir and spruce where access to prey is not hindered by thick herbaceous cover or deep-crusted snow (Hayward 1994).

The nearest CDC record of a boreal owl was a 1985 sighting approximately 13 miles northwest of the Project Area. No boreal owls were detected during the February/April 2003 baseline surveys. Douglas-fir and subalpine fir habitat types within the Study Area may provide mature spruce-fir forest for nesting, and subalpine fir and spruce stands for roosting and foraging. Patchy stands of mature Douglas-fir occur in the Manning Creek drainage; however, large stands of closed-canopy spruce-fir forests were not found. Therefore, the absence of good foraging and roosting habitat may deter boreal owls from using the area. The single boreal owl-specific RFP Guideline (USFS 2003a:3-32) is to maintain 40 percent of the forested acres in mature and old age classes within a 3,600-acre area around nest sites.

Greater Sage Grouse

Sagebrush and forb/graminoid habitat types within the Study Area provide cover habitat and potential lek sites for sage grouse. During 2003 field surveys (Maxim 2004j), four sage grouse were flushed in pastureland along Crow Creek (four miles southeast of Panel G), twelve sage grouse were observed near the confluence of Deer and Crow creeks (three miles southwest of Panel F South Lease), and three sage grouse were observed approximately one mile north of Manning Creek (2-3 miles east of Panel F). No active or historic sage grouse leks, traditional courtship display areas, were identified. Surveys conducted by IDFG located two sage grouse leks within approximately 10 miles of the Study Area (USFS 2005d). The closest lek was located 3.5 miles east of Panel F along Crow Creek basin. The other lek was located 10 miles northwest of the Study Area near the mouth of Stump Creek.

As a management indicator species, sage grouse populations are used to measure the health of sagebrush habitat on the CNF and vice versa, thus impacts to sagebrush habitat are used as a measurement of impacts to sage grouse (USFS 2003a:3-26). Other RFP Guidelines related to sage grouse direct that projects within 10 miles of a known sage grouse lek should be evaluated for potential habitat impacts to sage grouse, and that disturbances should be limited during the breeding (March – May) and nesting (May - June) seasons if sage grouse are present.

Trumpeter Swan

Trumpeter swans inhabit freshwater marshes, lakes, reservoirs, ponds, and occasionally rivers with wide stream reaches. The species requires a highly irregular shoreline, diverse vegetation, nesting substrate, space for flight take-off, and low levels of human disturbance for breeding (Maxim 2004j). Trumpeter swans were trans-located from northern areas into parts adjacent to the CNF, but the species has not been observed on the CNF itself (USFS 2003b:3-219). Neither suitable habitat for trumpeter swans nor evidence of trumpeter swan individuals was found during 2003 surveys (Maxim 2004j), although a landowner has reportedly observed individuals regularly in spring and fall northeast of the Study Area in the Crow Creek drainage, as well as on Book Spring pond within the Study Area (**Section 7.3.10**). The largest pond on a private ranch south of the Study Area (the largest water body in the Crow Creek drainage) provides suitable breeding habitat for trumpeter swan (USFS 2002a). Because there is no suitable breeding habitat for trumpeter swan on USFS land within the Study Area, the species will not be discussed further in this EIS.

Peregrine Falcon
Peregrine falcons occupy a wide range of habitats, typically found in open country near rivers, marshes, lakes, and coasts. Foraging habitat includes wetlands and riparian habitats, meadows and parklands, croplands and orchards, gorges, mountain valleys, and lakes that support good populations of small- to medium-sized terrestrial birds, shorebirds, and waterfowl. Cliffs are preferred nesting sites, although reintroduced birds now regularly nest on man-made structures such as towers and high-rise buildings (USFS 2003b:3-216).

There are historical, but currently unoccupied, nesting cliffs, as well as other potentially suitable nesting cliffs on the CNF. As numbers of peregrines increase in Idaho, some of these cliffs may become occupied. The CNF has the potential to contribute to a further increase in peregrine falcon populations in southeastern Idaho. The closest reported nest is located just west of Soda Springs, 20 miles west of the Project Area (USFS 2005d). There is only one known nest site currently on the CNF, near Grays Lake, approximately 30 miles northwest of the Project Area (USFS 2003b:3-217). The Study Area itself contains no suitable habitat for peregrine falcons.

RFP Standards and Guidelines (USFS 2003a:3-30) require that activities or habitat alterations be minimized within two miles of peregrine falcon nest sites, as well as prohibit the use of herbicides or pesticides (which could cause eggshell thinning) within 15 miles of nest sites.

Harlequin Duck
Harlequin ducks inhabit fast flowing mountain streams or rivers with forested banks. Suitable streams are of second- to fifth-order size, have a 1 to 7 percent gradient, and are usually associated with willow, pole-sized lodgepole pine, ponderosa pine, or Douglas-fir. Large streams with faster flow rates, undercut banks, and cobble to boulder-sized substrate are preferred. Reproduction is limited in areas with high human activity, high stream sedimentation, and a low invertebrate supply (Montana Partners In Flight 2000). There is no harlequin duck habitat in the Study Area. The nearest occurrence of a harlequin duck, provided by the Wyoming Natural Diversity Database (WYNDD), is a 1980 record approximately 17 miles east of the Project Area. No incidental observations of harlequin ducks occurred during 2003 data collection activities and the species is not expected to occur on the CNF (USFS 2003b:3-213). This species will not be discussed further in this EIS.

Flammulated Owl
Flammulated owls occur year-round in cool, temperate, semi-arid climates, migrating when necessary to maintain access to their insect prey. Their range is essentially co-extensive with mid-elevation pine forests. Habitat consists primarily of open ponderosa pine or similar dry montane forests (McCallum 1994). Forests used by flammulated owls include an interspersion of dense thickets for roosting within open, mature to old-growth stands of ponderosa pine, Douglas-fir, or aspen. Dense or young pine-fir stands and extensively cutover areas are avoided. Flammulated owls use woodpecker-excavated cavities in pines, aspens, or Douglas-fir, 7 to 25 feet above ground (DeGraaf et al. 1991). Five flammulated owl observations have been documented on the CNF and include: Worm Creek in 1993, Left Fork Fish Haven Canyon

in 1992, Smoky Canyon in 1999, head of East Fork Mink Creek in 1989, and Porcelain Pot Gulch in 1998 (USFS 2003b:3-218).

Drier areas of aspen, aspen/conifer, and Douglas-fir habitat types within the Study Area provide potential habitat for the flammulated owl. Dry, open, mature forests are generally absent. However, small, open patches of mature Douglas-fir interspersed with sagebrush and grassland can be found on south facing slopes in the northern portion of the Panel F lease area. Three flammulated owls were detected in the northeast portion of the Study Area (Maxim 2004j) during dedicated surveys in 2003, although no nest sites were identified. RFP Guidelines for flammulated owl habitat (USFS 2003a:3-32) state that no timber activities are allowed within a 30-acre area around nest sites.

Northern Three-Toed Woodpecker

Northern three-toed woodpeckers are primarily associated with dense subalpine fir and Engelmann spruce forests at higher elevations. They also forage in mixed pine, lodgepole pine, and Douglas-fir stands. Mature to old-growth stands are preferred due to an abundance of insect prey in large snags and downed woody debris. Three-toed woodpeckers are often abundant in forests recently disturbed by fire due to ensuing insect epidemics (Koplin 1972). In April 2001, three-toed woodpecker callback surveys conducted within the Panel F Study Area resulted in two responses (JBR 2001d). An observation of a three-toed woodpecker near the headwaters of Manning Creek is also reported in BLM and USFS (1998c). During Maxim's surveys, one three-toed woodpecker was observed on the forested north slope of the South Fork Sage Creek drainage. Older/mature stands of the subalpine fir and Douglas-fir habitat types may provide nesting and important foraging habitat (Maxim 2004j). RFP Standards and Guidelines for three-toed woodpeckers are related to maintaining snag habitat (see USFS 2003a:3-27). However, Prescription 8.2.2(g) – Phosphate Mine Areas, which allows for phosphate mining to occur on existing leases, states that snag habitat for woodpeckers shall not be a management consideration.

Great Gray Owl

The great gray owl is widely distributed throughout boreal forests of western North America, where it is associated with coniferous and hardwood forests, primarily Douglas-fir, aspen, and lodgepole pine stands up to 9,600-feet elevation. It forages in open forests, clear cuts, and meadow edges, primarily preying on voles and pocket gophers (Clark et al. 1989).

Open meadows, adjacent to stands of lodgepole pine and Douglas-fir, are common in the Study Area providing adequate nesting and foraging habitat for great gray owls. Two 1992 CDC records for the great gray owl exist approximately three miles north of the Project Area. An additional 1992 record is located approximately three miles west of the Project Area. A pair of great gray owls was observed in the Project Area during dedicated surveys in 2003 (map provided in Maxim 2004j). A follow-up survey in 2005 heard multiple responses in the same location, and concluded that a great gray owl territory is located in Panel G (USFS 2005e). RFP Guidelines for great gray owl habitat (USFS 2003a:3-32) state that within a 1,600-acre area around nest sites, maintain over 40 percent of the forested acres in mature and old age classes.

Columbian Sharp-Tailed Grouse

Historically, sharp-tailed grouse occupied native shrub-grasslands interspersed with scattered woodlands, brushy hills and draws, and edges of riparian woodland habitats throughout much of central and northern North America. This species is found in relatively open grassland habitats or in areas with low, scattered brush in late summer and autumn. In winter, it uses relatively dense shrub-thickets such as snowberry, willow, sagebrush, and quaking aspen for escape cover, roosting, and feeding. High structural diversity is preferred for high-quality nesting habitat. The Columbian subspecies inhabits sagebrush-grassland and mountain shrub habitats (Connelly et al. 1998).

Based on GIS data provided by the CNF, the nearest known sharp-tailed grouse lek is located approximately nine miles northwest of the Study Area. No incidental observations of sharp-tailed grouse were made during the 2003 surveys (Maxim 2004j), nor were observations of sharp-tailed grouse expected because the Study Area is outside existing and potential sharp-tailed grouse management areas (Ulliman et al. 1998). However, suitable winter habitat – aspen, chokecherry, and serviceberry – is available. Because the nearest lek is nine miles from the Study Area it is unlikely that the potential winter habitat in the Study Area is of high value.

Regarding standards and guidelines for sharp-tailed grouse, the RFP defers to "current guidelines for sage and sharp-tailed grouse management" (e.g., Connelly et al. 2000) to be used as a basis for sagebrush treatments. As a management indicator species, sharp-tailed grouse populations are used to measure the health of their habitat on the CNF and vice versa. However, impacts to grassland and open canopy sagebrush habitat (USFS 2003a:3-26) will not be used as a measurement of impacts to sharp-tailed grouse because nesting in the Study Area is not expected. Other RFP Guidelines related to sharp-tailed grouse direct that projects within two miles of a known sharp-tailed grouse lek should be evaluated for potential habitat impacts to sharp-tailed grouse, and that disturbances should be limited during the breeding (March – May) and nesting (May - June) seasons if sharp-tailed grouse are present. The Idaho Sharp-tailed Grouse Conservation Plan (Ulliman et al. 1998) recommends that in winter habitat, treatments should be limited to 20 percent of the area, leaving 80 percent available for winter forage.

Northern Goshawk

Northern goshawks inhabit montane coniferous and deciduous woodland in the western U.S., preferring woodland stands of intermediate to high canopy-closure and a thin understory interspersed with small openings, fields, or wetlands. Goshawks generally nest in large trees adjacent to open flight corridors. This species is primarily associated with mature to old growth stands of Douglas-fir, assorted pines, or aspen. In April 2001, JBR biologists identified a single juvenile goshawk within the Study Area (JBR 2001d). During 2003 surveys, Maxim recorded six goshawk detections in four different regions within or near the Study Area (maps provided in Maxim 2004j).

Although attempts were made to locate nests, no active goshawk nests were found in the Study Area, and the presence of nest territories or successful breeding pairs could not be determined. Forested stands within the aspen, aspen/conifer, Douglas-fir, and subalpine fir habitat types with open understory and adjacent small openings provide habitat for the goshawk. Given suitable habitat and six detections, it is assumed that one or more active nests may occur within, or near, the Study Area and that goshawks are present. In 2004 and 2005, two historic territories were surveyed in the Study Area near the intersection of South Fork Deer Creek and the proposed Panel G West Haul Road, but no active goshawk nests were found (TREC 2005 and McDaniel 2005). RFP Standards and Guidelines for the goshawk are extensive and are described in USFS (2003a:3-31). As a management indicator species, goshawk populations are used to measure the health of their habitat on the CNF and vice versa, thus impacts to mature and old growth forest habitat are used as a measurement of impacts to goshawk (USFS 2003a:3-26). One RFP guideline for goshawks states that forest openings larger than 40 acres should not be created in order to preserve foraging and post-fledgling family areas. In addition, management season guidelines state that active nests should not be present within a 400-acre area of mechanical treatments road building between September and March (USFS 2003a:3-31).

Regarding the tree size-class distribution for forested acres guideline, the evaluation area for goshawks has been defined as those portions of the five HUC6 watersheds located north of Crow Creek that contain the Proposed Action footprint. The evaluation area measures 48,893 acres, of which, approximately 31,219 is forested. **Table 3.7-3** shows the size-class distribution for forested acres within this area.

TABLE 3.7-3 TREE SIZE-CLASS DISTRIBUTION FOR FORESTED ACRES WITHIN THE GOSHAWK EVALUATION AREA

SIZE CLASS	ACRES	PERCENT OF FORESTED ACRES	RFP GUIDELINES FORAGING AREAS
Nonforested (grass, water, rock)	17,674		
Nonstocked/Seedling (<5 years old)	515	2%	<25%
Sapling (5-20 years old)	309	1%	<25%
Pole (20-50 years old)	965	3%	<25%
Mature/Old (>50 years old)	29,430	94%	>30%
TOTAL FORESTED	**31,219**		
GRAND TOTAL	**48,893**		

Columbia Spotted Frog

To date, amphibian surveys on the CNF have not recorded any Columbian spotted frogs, nor has this species been found in Southeastern Idaho (USFS 2003b:3-223). A segment of the Great Basin population is found in the southwest part of the state, and a segment of the Yellowstone population is found to the north of the CNF. Columbian spotted frogs require still-water habitats, typically laying egg masses just beneath the water's surface on the flooded margins of wetlands, ponds, or lakes (Hallock and McAllister 2002). The species is not expected to occur on the CNF (USFS 2003b:3-213) and will not be discussed further in this EIS.

3.7.3 Management Indicator Species (MIS)

The CNF designates three bird species as MIS (USFS 2003a:3-224, **Table 3.7-4**). All three species are also USFS Sensitive species and are discussed in **Section 3.7.2**.

TABLE 3.7-4 MIS AND ASSOCIATED HABITAT FOR THE CARIBOU NATIONAL FOREST

MANAGEMENT INDICATOR SPECIES	HABITAT
Columbian Sharp-Tailed Grouse	Grassland and Open Canopy Sagebrush
Greater Sage Grouse	Sagebrush
Northern Goshawk	Mature and Old Forest Structure

3.7.4 Migratory Land Birds

In January 2001, outgoing President Clinton signed Executive Order 13186 that required some federal agencies (those taking actions that may negatively impact migratory birds) to develop a MOU with the USFWS to promote the recommendations of various migratory bird programs and conservation considerations. The BLM and USFS developed a draft MOU in 2001 with the USFWS. The coordinated implementation plans developed by, for example, the Intermountain West Joint Venture (IWJV), are to assist federal agencies with the MOU. Director's Order 146, which indicated that joint ventures should "deliver the full spectrum of bird conservation," was issued on 12 September 2002 by the USFWS Director under President Bush. Also in 2002, Congress passed a revised Neotropical Migratory Bird Conservation Act, funded by a grant predicated on development of Comprehensive Wildlife Strategies by wildlife agencies in each state. Partners in Flight (PIF) began in 1988 as a coordinated, nationwide effort to document and reverse apparent declines in neotropical migratory birds and was later expanded to include all nongame land birds. The PIF chapter in Idaho was formed in 1992, and released Version 1.0 of the Bird Conservation Plan (BCP), based on an assessment of 243 species of breeding birds in Idaho, including 119 species of neotropical migrants, in 2000 (Ritter 2000).

The Study Area provides a diversity of habitats for many species of migratory birds. Riparian, non-riverine wetlands, and sagebrush are three of the four highest priority habitats ("Priority A") identified in the Idaho BCP (Ritter 2000), defined as being under high threat, having high opportunity, and high value to birds statewide. All three habitats are found on the CNF and in the Study Area. The Coordinated Implementation Plan for Bird Conservation in Idaho (IWJV 2005), which updated Ritter (2000), also includes aspen as a Priority A habitat. Aspen is the most abundant vegetation community in the Study Area (see **Section 3.5.2**).

Most migratory birds are found in riparian habitats. Of the 247 avian species known/suspected to occur on the CNF, 211 are associated with riparian habitats (USFS No Date) found along perennial streams. Of the 108 neotropical landbird species known/suspected to occur on the CNF, 101 are associated with riparian habitats (USFS 1991). Non-riverine wetland areas on the CNF that may be used by migratory birds include seeps, springs, and small beaver ponds. Regarding other Priority A habitats, sagebrush and aspen woodlands are found throughout the Forest (see **Section 3.5.2**).

Four bird species that were detected by Maxim (2004j) in the Study Area are listed as Idaho Priority Bird Species in the Coordinated Implementation Plan (IWJV 2005). They are Clark's nutcracker (*Nucifraga Columbian;* high elevation spruce-fir habitat; none mapped in Study Area), warbling vireo (*Vireo gilvus*; aspen habitat), Williamson's sapsucker (*Sphyrapicus thyroids*; Douglas-fir and subalpine fir habitats), and willow flycatcher (*Empidonax traillii*; riparian habitat). Only warbling vireo and willow flycatcher occur in the highest priority ("A") habitats identified by the BCP and in IWJV (2005). Although its preferred habitat is not mapped in the Study Area, Clark's nutcracker is discussed because the species was detected during surveys. Wiliamson's sapsucker is discussed with regard to conifer habitat (Douglas-fir and subalpine fir in the Study Area).

The needs of other migratory birds have been incorporated into the CNF Forest Planning process in several areas: identification of Species at Risk, used to identify species of concern on the CNF; habitat conservation measures for priority habitats (i.e., riparian, non-riverine wetlands, sagebrush, and aspen); individual species (i.e., TECS species) have guidelines to manage habitats and mitigate effects of projects; and cavity nesters are addressed through snag guidelines.

3.7.5 Big Game

Mule Deer (*Odocoileus hemionus*) and Rocky Mountain Elk (*Cervus canadensis*) are the two most visible big game species in the Study Area and can be found there year-round. They are very important species for the local economy and public interest, but are no longer MISs under the revised RFP. Moose (*Alces alces*) are also present in the Study Area. USFS (2003b) has identified 18 percent of the CNF as big game winter range habitat. Only 30 percent of the mule deer that summer on the CNF actually use the winter range on the CNF; most move to adjacent private and state owned lands (USFS 2003a).

Regional studies conducted by Kuck (1984) found that most elk in Southeastern Idaho tend to be nomadic but do not migrate long distances between summer and winter ranges. The mean year-round home range for elk was 26 square miles, with a mean migration distance between summer and winter ranges of 3.6 miles. Mule deer tend to migrate greater distances (mean = 13.7 miles) between summer and winter ranges. Moose tend to use the same high-elevation forested sites year-round; year-round home ranges were small (mean = 10.0 square miles). In general, during winter within the Study Area, deer tend to utilize sagebrush/shrub on southerly and west aspects, elk tend to utilize mountain mahogany on southerly and west aspects, and moose tend to utilize aspen on northerly and east aspects. Based on 2002 GIS data provided by the CNF, approximately 5,400 acres of an 18,230-acre big game winter range polygon occurs within the Study Area (**Figure 3.7-1**). This figure represents 28 percent of the Study Area and 30 percent of the identified winter range polygon. No critical winter range habitat is located within the Study Area.

During field surveys, elk and elk sign were commonly observed in the Study Area on the foothills east and west upslope of Crow Creek, generally on the lower, east-facing slopes of the Webster Mountain Range from South Fork Sage Creek to Wells Canyon during all seasons (Maxim 2004j). The Sage Meadows area was observed being used as a calving area. In winter and fall, herds of elk were observed using aspen and mountain shrub-sagebrush cover types in the lower elevation foothills northwest of Manning Creek and sagebrush-riparian cover types in the Crow Creek bottomlands. At least one private property owner in the Crow Creek area provides food on their property for elk. During winter, elk frequently occur in this area.

Maxim observed mule deer on the foothills upslope of Crow Creek, generally on the lower east slopes of the Webster Range from South Fork Sage Creek to Wells Canyon. Mule deer tracks were common throughout the Study Area during all seasons. Mule deer were observed utilizing sagebrush, aspen-conifer, aspen, and mountain mahogany cover types. Moose sign was most evident in riparian areas. Any habitat type in the Study Area may be utilized by big game individuals during seasonal migrations.

As reported by the Idaho Department of Fish and Game (IDFG), elk populations are near all-time highs, with elk populations doubling in Southeastern Idaho since 1984 (Compton 2003). The Idaho portion of the Study Area occurs entirely within IDFG Hunting Unit 76, one of two units comprising the Diamond Creek Elk Management Zone. A population of 3,690 elk, above the 2,100 population objective, in this Zone was estimated from surveys conducted by IDFG in 2002 (USFS 2003b:3-238). The IDFG's objective related to adult bull:cow elk ratios within the Zone is 18 to 24 adult bulls per 100 cows; the current ratio is 19:100. Although elk populations are increasing, mule deer populations have declined since the 1950s and 1960s. Mule deer have been reduced by approximately 50 percent in Southeastern Idaho since 1984 (Compton 2003). The recent decline is a result of severe winters, which resulted in significant winter mortality. For estimating mule deer populations, the IDFG has divided the state into 22 Analysis Areas which contain groups of Hunting Units. The Study Area occurs within Hunting Unit 76 (889,324 acres), which is part of Analysis Area 22. The current mule deer population estimate for Analysis Area 22 is 6,660 animals; this figure is below the 10,000 minimum population objective (USFS 2003b:3-236). Concerning moose, the most recent estimate in the area was

Figure 3.7-1 Big Game Winter Range

conducted by IDFG in 1999 for Hunting Unit 76. During surveys, 140 moose were observed; population estimates are between 437 - 729 animals (IDFG 2000).

Under Prescription 8.2.2 (g) in the RFP, a guideline for wildlife states that mining operations should be designed to accommodate big game migration (USFS 2003a:4-84).

3.7.6 Other Wildlife Species

Predators

In addition to the gray wolf, Canada lynx, and North American wolverine (described above), the American marten (*Martes americana*) and fisher (*Martes pennanti*), also have the potential to exist within and around the Study Area, as potential habitat and prey base are present. No evidence of the American marten or fisher were observed during forest carnivore surveys conducted by Maxim in January and February of 2003 (Maxim 2004j).

During carnivore surveys, and from incidental observations, the following predators were recorded within the Study Area: mountain lion (*Felis concolor*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), black bear (*Ursus americanus*), bobcat (*Lynx rufus*), and long-tailed weasel (*Mustela erminea frenata*). Mountain lion tracks were observed on South Fork Sage Creek, near the confluence of Manning and Crow Creeks, and along lower Deer Creek. Coyote and long-tailed weasel tracks were common throughout the Study Area. A red fox den was located along Crow Creek road near the Idaho and Wyoming border. One black bear was sighted at the south end of the Panel F lease area. The remains of a bobcat were found along Deer Creek near the confluence with Crow Creek. The majority of the predators found in the area feed on small mammals and birds and utilize most of the habitat types found in the Study Area. Mountain lions typically occur in areas with high populations of elk and mule deer.

Bats

Bat surveys were conducted by Maxim during the summer of 2003 (Maxim 2004j). Sixteen survey sites were selected within the Study Area based on vegetation types and specific habitat features (e.g., beaver ponds, rock outcrops, small ponds, seeps, and stock ponds). These areas were surveyed using mist nets and a tunable, broadband, ultra-sonic bat detector. Six species were detected: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), long-eared myotis (*Myotis evotis)*, long-legged myotis (*Myotis volans*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*). No TEPCS bat species were detected. The four most abundant species recorded, the little brown bat, long-legged myotis, long-eared myotis, and silver-haired bat, have habitat requirements mainly associated with forested areas. Roost sites for these species include tree cavities, snags, and under exfoliating bark. Long-legged and long-eared myotis will also roost in cliff and rock crevices and in mine adits (IMNH 2001). In general, sites with high bat activity featured mature aspen, or mixed conifer forest including aspen stands. Small ponds, stock ponds, and beaver ponds were also important components of high bat activity areas.

Under Prescription 8.2.2 (g) in the RFP, a guideline for wildlife states that the construction of ledges on suitable highwalls be encouraged to accommodate cliff-dwelling species (such as some species of bats).

Raptors

The habitat types in the Study Area provide numerous nesting, perching, and foraging opportunities for raptors from early spring (February/March) to late summer (August). Callback surveys were performed for boreal owl, great gray owl, flammulated owl, and northern goshawk (see **Section 3.7.2**). The following raptors were observed or heard during field surveys: great gray owl, flammulated owl, northern goshawk, American kestrel (*Falco sparverius*), golden eagle (*Aquila chrysaetos*), great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*), northern pygmy owl (*Glaucidium gnoma*), osprey (*Pandion haliaetus*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), rough-legged hawk (*Buteo lagopus*), sharp-shinned hawk (*Accipiter striatus*), and Swainson's hawk (*Buteo swainsoni*). Many of these species likely nest in the conifer and aspen stands, and/or forage in the diverse vegetation communities in the Study Area. The only nests identified were two red-tailed hawk nests, one along South Fork Sage Creek and one along Deer Creek.

Upland Game Birds

Sharp-tailed grouse and greater sage grouse are discussed above as Sensitive species. Regarding blue (*Dendragapus obscurus*) and ruffed (*Bonasa umbellus*) grouse, forest communities within the Study Area provide habitat for these species, and incidental observations of each were recorded during field surveys conducted by Maxim in 2003 (Maxim 2004j).

Woodpeckers

The major forest types used by woodpeckers are aspen, mixed conifer, Douglas-fir, spruce/fir, and lodgepole pine (USFS 2003b); these forest types are found within the Study Area. Within these habitats, woodpeckers rely on dead and dying trees for nesting and foraging. Seven woodpecker species are found on the CNF (Stephens and Sturts 1998): Lewis' woodpecker (*Melanerpes lewis*), red-naped sapsucker (*Sphyrapicus nuchalis)*, Williamson's sapsucker (*Sphyrapicus thyroideus*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), northern three-toed woodpecker, and northern flicker. All but the Lewis' woodpecker were observed in the Study Area during 2003 field surveys. The CNF RFP has set standards and guidelines for snag/cavity nesting habitat; however, Prescription 8.2.2(g) – Phosphate Mine Areas, which allows for phosphate mining to occur on existing leases, states that snag habitat for woodpeckers shall not be a management consideration.

Amphibians and Reptiles

Based on an assessment of habitat types within the Study Area and a review of the Northern Intermountain Herpetological Database, six species of amphibians were determined to potentially occur in the Study Area: tiger salamander (*Ambystoma tigrinum*), boreal chorus frog (*Pseudacris maculata*), Columbia spotted frog, northern leopard frog, western toad (*Bufo boreas*), and great basin spadefoot toad (*Spea intermontana*). Three of these are considered rare: Columbia spotted frog, northern leopard frog, and western toad. The Columbia spotted frog is a sensitive species and is discussed in **Section 3.7-2**; the northern leopard frog and western toad, discussed below, are listed as a Species at Risk by the CNF and have special management criteria in the RFP.

Field investigations in 2003 included two survey periods, spring and summer, to evaluate the presence of amphibians and reptiles. Methods used during the spring survey included calling and visual encounter surveys (VES). Field methods used during the summer survey period included VES, road surveys, seine sampling surveys, aquatic funnel trapping, pitfall surveys, and incidental observations. Tiger salamanders were the most abundant species detected within the Study Area, mainly in beaver ponds. Chorus frogs were also found, as well as western terrestrial garter snakes (*Thamnophis elegans*).

Concerning western toads, this species uses three different types of habitat: breeding habitats, terrestrial summer range, and winter hibernation sites. Preferred breeding sites are permanent or temporary water bodies that have shallow sandy bottoms. After breeding, adults disperse into terrestrial habitats such as forests and grasslands. They may roam far from standing water, up to approximately 1.5 miles (Keinath and McGee 2005), but prefer damp conditions. Western toads spend much of their time underground; though they are capable of digging their own burrows in loose soils, they generally shelter in small mammal burrows, beneath logs and within rock crevices. They hibernate in burrows below the frost line, up to 1.3 meters (4.3 feet) deep (Frogwatch 2004). The Study Area provides habitat for this species, and five western toad tadpoles were observed in small ponds at Sage Meadows. The population discovered in Sage Meadows is the only known population of western toads on the Montpelier Ranger District. **Figure 3.7-2** shows the extent of potential western toad migration (1.5-mile radius) from Sage Meadows.

The northern leopard frog inhabits sluggish, permanent waters with rooted aquatic vegetation such as ponds, marshes, lakes, and slow streams. They require moderate to high herbaceous cover to avoid predators, preferring tall grasses or sedges near water. They often forage around springs, and in wet or damp meadows and fields. They are very well adapted to cold conditions and can be found at elevations above 8,000 feet (Groves et al. 1997). Although potential suitable habitat exists within the Study Area, the species was not detected during surveys.

3.7.7 Selenium Issues with Wildlife

Selenium is an essential nutrient for animals, and the deficiency and toxicity relationships are fairly well understood for livestock and laboratory animals. Less is known about selenosis and background selenium levels in terrestrial wildlife. A number of studies have been conducted in recent years to determine the effects of selenium on terrestrial wildlife in Southeastern Idaho. Sampling results in proximity to phosphate mine sites and selenium release areas indicate elevated levels of selenium in every environmental media and species of wildlife tested (IDEQ 2004a).

As summarized in MWH (2003), selenium toxicity and deficiency can both cause adverse effects in wildlife. Idaho and other areas of the West are typically considered selenium deficient; consequently, the effects of chronic selenium deficiencies on free-ranging wild ungulates dominate the focus of selenium concerns in wild ungulates, not selenium toxicosis. Selenium deficiency lowers reproduction rates primarily through increased neonate and pre-weaning mortality. Relatively small elevations in selenium above optimal nutritional levels can result in potentially toxic forage. Selenium poisoning can affect all animals but is more common in species that directly consume seleniferous vegetation than in carnivores consuming wildlife with elevated selenium levels. Acute selenium poisoning is rare under field conditions and is caused by the short-term consumption of forage that is very high in selenium. Death can follow within a few hours after consumption. Chronic selenium poisoning is recognized in two forms: alkali disease and blind staggers. Alkali disease is associated with prolonged consumption of low levels of seleniferous forage, resulting in general lack of vitality, hair loss, hoof soreness, deformation and shedding, and stiffness and lameness. Blind staggers is associated with consumption of seleniferous forage with moderate levels of selenium, ultimately resulting in death.

In recent years, there has been a large increase in the number of reclaimed phosphate mine overburden fills. These overburden fills vary in size from a few acres to hundreds of acres but still only account for less than one percent of the phosphate resource area of Southeastern Idaho (MWH 2003). Elk, mule deer, and moose disperse across the entire area and use a variety of habitats. The majority of these animals' home ranges do not encompass overburden fills and their associated seleniferous forage (MWH 2003). However, some elk and deer do have home ranges that encompass areas that contain seleniferous forage, and thus, consumption of this forage does occur and has been documented (USFS 2006a). The quantity, frequency, and duration of consumed seleniferous forage would be restricted by the tendency for elk to follow the progression of developing nutritious forage across a variety of terrain and vegetation types (MWH 2003). Moose preference for closed canopy aspen/conifer stands and associated forage types limits the potential use and value of phosphate mine reclaimed areas with potential forage high in selenium levels.

Seleniferous forage is not available or used in the winter, except by some elk, allowing most if not all ingested selenium to be metabolized by each spring.

Currently, elk populations in Southeastern Idaho are at a historic high with a population increase of 1,500 percent, an average of 30 percent annually over the past 50 years (MWH 2003). This high rate of increase supports a conclusion that the presence of selenium in this elk herd's environment has not had a negative effect on the herd (MWH 2003). Elk surveys conducted by IDFG and Idaho Mining Association in the fall of 1999 and 2000 (MW 2000) showed a significant inverse correlation between elevated selenium levels in elk livers versus the distance of harvested elk from the nearest phosphate mine. Approximately 50 percent of elk harvested within a two-mile radius of historic reclaimed phosphate mining areas showed elevated levels of selenium in their organs, whereas elk harvested 10 miles or more from phosphate mine leases did not have elevated selenium exposure. Eleven elk were sampled from within five miles of the Smoky Canyon Mine. Three of these elk showed signs of elevated selenium levels when compared to the control group. None of the 141 elk livers sampled exceeded thresholds for mammalian livestock toxicity and no muscle tissue concentrations exceeded USDA interim standard for beef of 1.2 mg/Kg dw (Wright et al. 2002). The IDFG and Idaho Division of Health concluded that elevated selenium levels in a small percentage of elk livers could result in acute gastrointestinal effects to humans, if consumed in large and persistent portions. Subsequently, the IDFG and Idaho Division of Health posted a human health advisory in the fall of 2000, recommending limited consumption of elk livers by area hunters.

The IDEQ concluded that foraging mammals with smaller home ranges than elk could be experiencing higher doses of selenium and associated risks. Small mammal whole body sample concentrations observed in selected impacted areas ranged from 50-70 mg/Kg dw when typical reported background levels were in the range of 1-4 mg/Kg dw (IDEQ 2004a). NewFields (2005b) measured the COPC (including selenium) content of small mammals across Smoky Canyon Mine Panels A, D, and E, where reclamation did not include selenium control measures of any kind, both within and adjacent to reclaimed areas. In deer mice, mean selenium accumulation outside and within mined/reclaimed areas was 0.72 mg/Kg and 5.83 mg/Kg, respectively. In redback voles, mean selenium accumulation outside and within mined/reclaimed areas was 0.57 mg/Kg and 1.44 mg/Kg, respectively.

Figure 3.7-2 Western Toad Habitat at Sage Meadows

Ratti et al. (2002) looked at selenium concentrations in 544 bird eggs, 271 from mining areas and 273 from background areas, in Southeastern Idaho during 1999 and 2000. Eggs were analyzed from 31 species including waterfowl, shorebirds, raptors, woodpeckers, swallows, and many passerines. Data showed that 16 of the 24 (67 percent) bird species analyzed showed significantly higher levels of selenium in eggs collected from phosphate mine sites than background areas. Eighty-seven percent of eggs collected from the mining sites had selenium levels of 10 mg/Kg or less, 8 percent were between 10 and 16 mg/Kg, and 5 percent were greater than 16 mg/Kg. Recent reports concluded that a selenium effects threshold of 12-14 mg/Kg dw, based on chick mortality and developmental malformations, appears appropriate and conservative (Adams et al. 2003). Ratti et al. (2002) suggest that for the range of selenium levels in bird eggs on both background and mining sites, reproductive success was actually enhanced with elevated levels of selenium; however, additional research would be required to confirm this relationship. Garton et al. (2002a) conducted a population-level assessment on metapopulations of red-winged blackbirds and American robins in Southeastern Idaho. The population-level assessment of the impact of selenium on red-winged black birds and American robins demonstrated no substantial impact from phosphate mining in 2001. Follow-up bird egg samples were conducted in IDEQ-identified impacted zones during 2002 and indicated much higher selenium concentrations than previously recorded, many over 20 mg/Kg (Garton et al. 2002b).

Elevated levels of selenium have also been confirmed in salamanders at a phosphate mine on the Fort Hall Indian Reservation, Idaho and at Smoky Canyon Mine. Concentrations of selenium in some individuals were 10 to 100 times the normal level in animal tissue. There is only limited information about the effects of selenium in amphibians. Viral infections found in salamanders at both sites may be linked to high selenium body burdens (USGS 2001a and 2001b). Eggs and larvae of amphibians may be the most sensitive life stages to direct effects of waterborne selenium. In laboratory exposures, amphibian embryos and tadpoles were about as sensitive as aquatic invertebrates and fish larvae/fry to the effects of waterborne selenium (Ohlendorf 2003:483).

3.8 Fisheries and Aquatics

3.8.1 Introduction

Maxim conducted a baseline assessment of stream morphology (**Section 3.3**), amphibians and reptiles (**Section 3.7**), benthic invertebrates, and fisheries within the Project Area during the summer of 2003 and additional work in November of 2004. In January 2006, Maxim conducted a follow-up investigation of selenium and cadmium levels in benthic invertebrates, sediment, and fish tissue, and a genetic analysis of cutthroat trout. These studies provided the majority of baseline data on biological and physical characteristics of the streams that might be influenced by any of the Action Alternatives. Baseline technical reports were prepared and provide details on Maxim's methodologies, results, and conclusions. These reports also provide maps indicating the locations of sampling areas (see Maxim 2004c and 2004k). The following is largely summarized from Maxim 2004k (2003 Baseline Technical Report), Maxim 2005b (Addendum to the 2003 Baseline Technical Report), and Maxim 2006 (Second Addendum to Baseline Technical Report). For sensitive species, life history studies of fish, and prior fish surveys, other sources were used to supplement baseline information provided by Maxim.

RFP Standards and Guidelines for aquatic and fisheries resources (USFS 2003a:3-16) are in Prescription 2.8.3 (USFS 2003a:4-45 to 4-53). This prescription applies to the Aquatic Influence

Zone (AIZ) associated with lakes, reservoirs, ponds, streams, and wetlands. AIZ widths are described in the RFP. For this analysis, AIZ widths were defined as the following map distance buffers: 300 feet for perennial streams; 150 feet for ponds, lakes, and wetlands greater than one acre; and 50 feet for seasonally flowing or intermittent streams, and for wetlands less than one acre. The Study Area contains approximately 1,225 acres of AIZs**.** Current disturbances, mainly roads, within these AIZs measure approximately 20 acres.

3.8.2 Benthic Macroinvertebrates

Benthic macroinvertebrates live in the bottom parts of waters, usually on or in the stream or water body substrate. Benthic macroinvertebrates play a key role in the structure and function of stream ecosystems because they are a primary component of fish diets and critical in the processing of organic detritus. As a result, they are a good indicator of watershed health. Macroinvertebrate sampling within the Study Area followed Barbour et al. (1999). This procedure involves collecting benthic macroinvertebrates from selected stream locations and assessing stream health based on biological indicators such as the relative abundance of macroinvertebrate taxa sensitive to water quality conditions. Drought conditions during 2003 apparently caused degradation or loss of macroinvertebrate habitat in the Study Area, which subsequently reduced the number of proposed sample locations to only those where suitable habitat conditions existed. Eleven macroinvertebrate sampling locations were established within five different streams in the Study Area. Four locations were created on Deer Creek (DC). Two sampling locations each were created on South Fork Sage Creek (SFSC), North Fork Deer Creek (NFDC), and Crow Creek (CC). One sample was collected from Wells Canyon (WC).

Macroinvertebrate data provided a list of species, relative abundance, number of taxa, dominant taxa, and percent dominant taxa for each stream location. Further analysis was performed to calculate biotic integrity indices; ratios of functional feeding groups (e.g., predators, scrapers, gatherers); ratios of Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies) taxa, and Chironomidae (midges); and tolerance quotients, tolerance values, and community similarity indices. The Shannon-Weaver Index (H') was also calculated for each stream reach. Shannon-Weaver values range from 0 to 4, values <1.0 indicate severe stress, values >2.5 indicate healthy macroinvertebrate populations (Maxim 2004k). **Table 3.8-1** displays the results of the macroinvertebrate sampling. The Shannon-Weaver diversity index indicates relatively poor environmental conditions or the occurrence of environmental stress factors for most streams in the Study Area. Specifically, these indices indicate that in most streams, either the number of invertebrate species is low or the abundance of one or more invertebrate species is low.

TABLE 3.8-1 MACROINVERTEBRATE DATA SUMMARY OF STREAM REACHES SAMPLED IN STUDY AREA

REACH	CORRECTED ABUNDANCE (# IND)	DOMINANT COMMUNITY COMPOSITION (% ORDER)	DOMINANT EPT TAXA (% ORDER)	RICHNESS (#SPC.)	SHANNON-WEAVER INDEX (H')	DOMINANT FFG (% FFG)
SFSC-500	1,441	22.9 Diptera	6.38 Ephemeroptera	26	0.87	55.38 Gatherers
SFSC-700	609	79.2 Diptera	8.54 Ephemeroptera	24	0.68	72.91 Gatherers
NFDC-200	1,332	34.53 EPT Taxa	18.62 Ephemeroptera	30	1.11	68.09 Gatherers
NFDC-700	1,357	47.83 EPT Taxa	32.42 Plecoptera	28	0.96	48.64 Gatherers

REACH	CORRECTED ABUNDANCE (# IND)	DOMINANT COMMUNITY COMPOSITION (% ORDER)	DOMINANT EPT TAXA (% ORDER)	RICHNESS (#SPC.)	SHANNON-WEAVER INDEX (H')	DOMINANT FFG (% FFG)
DC-100	436	41.06 EPT Taxa	30.50 Ephemeroptera	23	0.99	64.45 Gatherers
DC-200	1,098	60.11 EPT Taxa	39.07 Ephemeroptera	25	0.99	50.82 Gatherers
DC-400	954	29.04 EPT Taxa	15.83 Plecoptera	30	0.82	63.73 Predators
DC-600	1,462	54.51 EPT Taxa	26.47 Trichoptera	40	1.12	44.46 Gatherers
CC-100	1,114	33.57 Diptera	14.18 Ephemeroptera	27	1.01	49.82 Gatherers
CC-300	1,597	28.62 Coleoptera	18.85 Trichoptera	46	1.13	35.07 Gatherers
WC-900	737	44.50 EPT Taxa	28.49 Plecoptera	30	0.91	56.72 Gatherers

EPT = Ephemeroptera, Plecoptera, Tricoptera; FFG = Functional Feeding Group.

IDEQ evaluates monitoring data using its Water Body Assessment Guidance (WBAG) to determine if each of Idaho's water bodies meets water quality standards and supports beneficial uses (e.g., recreational activities, ability to support aquatic life). This information is reported to the EPA for 305(b) and 303(d) under the Clean Water Act. The Stream Macroinvertebrate Index (SMI), Stream Fish Index (SFI), and Stream Diatom Index (SDI) are direct biological measures of cold-water aquatic life used by the IDEQ. Both the SMI and SFI are based on condition categories in the 25th percentile of reference conditions (SDI has no minimum threshold established), which is considered adequately conservative to identify a site in good condition. Each condition category is assigned a rating of 1, 2, or 3 (**Table 3.8-2**), which allows IDEQ to integrate multiple indices into one score that is used to determine use support. This "integrated" metric describes overall stream condition.

TABLE 3.8-2 SMI, SDI, AND SFI SCORING AND RATING CATEGORIES

INDEX	MINIMUM THRESHOLD	1	2	3
SMI	<11	11-13	14-16	>16
SDI	NA*	<22	22-33	>34
SFI	<54	54-69	70-75	>75

*A minimum threshold has not been identified.

The IDEQ has sampled portions of Deer Creek and North Fork Deer Creek for its water body assessments since 1998. In 2003, the SFI ratings for cold-water aquatic life and for salmonid spawning in the North Fork were both 3 (SFI = 85.11), indicating high quality habitat for fish. The rating in 2003 for salmonid spawning in Deer Creek was 2 (SFI = 78.76), indicating moderately high quality habitat, where salmonid spawning is likely supported. The SMI scores for Deer Creek and North Fork Deer Creek in 2003 were both 3 (Deer Creek SMI = 62.39; North Fork Deer Creek SMI = 58.39), indicating that macroinvertebrate populations are fully supported. These scores suggest different conditions than those indicated by the Shannon-Weaver indices calculated by Maxim (above).

3.8.3 Fisheries

Based on a review of existing data, the following fish species were determined to potentially inhabit aquatic systems within the Study Area: brown (*Salmo trutta*), brook (*Salvelinus fontinalis*), and cutthroat (*Oncorhynchus clarki*) trout; mountain whitefish (*Prosopium williamsoni*); longnose (*Rhinichthys cataractae*) and speckled (*Rhinichthys osculus*) dace; northern leatherside chub (*Lepidomeda copei*); and mottled (*Cottus bairdi*) and Piute sculpin (*Cottus beldingi*). Yellowstone cutthroat trout (YCT; *Oncorhynchus clarki bouvieri*) is the subspecies of cutthroat trout native to the Study Area. Data collected by Issak (2001) in 1996-1997 and by Meyer et al. (2003) in 1999-2000 indicated that YCT were the dominant species in at least Deer Creek and some areas of Crow Creek (**Table 3.8-3; Figure 3.8-1**).

TABLE 3.8-3 FISH ABUNDANCE IN STUDY AREA STREAMS, FROM ISSAK (2001) AND MEYER ET AL. (2003)

	Source	site#	# fish	Relative Abundance (%)				Relative Biomass (%)			
				SPECIES*				SPECIES*			
				YCT	BT	WF	BNT	YCT	BT	WF	BNT
Crow Creek	Issak (2001)	I-CC01	147	8.2	--	68	23.8	6.7	--	65.2	28.1
	Issak (2001)	I-CC02	63	20.6	--	39.7	39.7	13.4	--	45.1	41.5
	Issak (2001)	I-CC03	24	83.3	--	--	16.7	75.2	--	--	24.8
	Issak (2001)	I-CC04	11	100	--	--	--	100	--	--	--
	Meyer et al. (2003)	M-CC01	43	23.8	--	--	76.2				
	Meyer et al. (2003)	M-CC02	126	92.8	--	--	7.2				
Deer Creek	Issak (2001)	I-DC01	17	100	--	--	--	100	--	--	--
	Issak (2001)	I-DC02	17	100	--	--	--	100	--	--	--
	Issak (2001)	I-DC03	13	100	--	--	--	100	--	--	--
	Issak (2001)	I-DC04	26	65.4	34.6	--	--	85.3	14.7	--	--
	Meyer et al. (2003)	M-DC01	85	92.9	--	--	7.1				
Sage Creek	Issak (2001)	I-SC01	41	34.1	--	9.8	56.1	13.5	--	19.5	67.0
	Issak (2001)	I-SC02	48	2.1	--	--	97.9	1.0	--	--	99.0
	Issak (2001)	I-SC03	37	--	--	--	100	--	--	--	100
	Issak (2001)	I-SC04	17	100	--	--	--	100	--	--	--
	Meyer et al. (2003)	M-SC01	140	22.1	--	--	77.9				

*YCT = Yellowstone Cutthroat Trout, BT = Brook Trout, WF = Whitefish, BNT = Brown Trout

Fish Surveys by Maxim

Methods

Fish surveys were conducted by Maxim during August 2003, in all likely fish-bearing streams in the Study Area. Fish surveys of streams containing abundant fish habitat were conducted using a backpack electrofishing unit. Areas containing suitable fish habitat were identified based on availability of water, water depth, and other habitat features. Stream reaches composed of several contiguous units were sampled. Sampling of reaches was conducted to provide both qualitative (presence/absence of fish and species composition) and quantitative (fish population

Figure 3.8-1 Fisheries and Aquatics Survey Locations

parameters and fish condition) data. Four sampling reaches were established on Deer Creek, two on North Fork Deer Creek, and two on Crow Creek **(Figure 3.8-1)**. South Fork Sage Creek, South Fork Deer Creek, and the Wells Canyon drainage were determined to harbor limited and/or sparsely distributed fish habitat. Therefore, sampling reaches suitable for quantitative analysis were not established on these streams. Areas containing suitable fish habitat on South Fork Sage Creek and South Fork Deer Creek were qualitatively sampled. A small segment of the Wells Canyon drainage near the confluence with Crow Creek was determined to harbor potential fish habitat. A 10-meter segment of this portion of the drainage was sampled to determine presence/absence of fish; no fish were captured and the effort was terminated. Manning Creek was found to be an ephemeral drainage with no standing water or potential fish habitat, and was therefore not sampled.

Multiple-pass surveys were conducted on Deer Creek, North Fork Deer Creek, and Crow Creek. Three passes were made in half of these sample reaches (two in Deer Creek, one in North Fork Deer Creek, and one in Crow Creek) while two pass surveys were made in the remaining reaches. Maxim (2004k) reported that population estimates in two-pass reaches were unreliable because the two-pass surveys failed to produce a downward trend in the number of fish captured. As a result and at the request of the USFS, additional surveys were conducted in November 2004 on one reach of Deer Creek (DC-400) and on one reach of Crow Creek (CC-100) (Maxim 2005b).

Data from multiple pass surveys were used to estimate fish population metrics such as density (number of fish/meter^2) and biomass (Kg/hectare) using the program Microfish developed by Van Deventer and Platts (1983). Microfish was also used to compute the mean condition factor for fish captured in sampling reaches on Deer Creek, North Fork Deer Creek, Crow Creek, and South Fork Deer Creek. Microfish uses Fulton's condition factor (K) for computation of this metric. The mean value of K for fish sampled is typically close to 1.0 for a robust trout population (Chadwick 2001). Fish per stream mile was calculated as a proportion of the number of fish collected per 100 meters. Because population estimates and condition factor results were found to be imprecise for several stream reaches, relative abundance and trophic composition for fish captured in each stream reach were computed to provide additional characterization of fish populations.

<u>Results</u>

Results of fish surveys by Maxim (2004k and 2005b) are summarized in **Table 3.8-4**. YCT had the greatest relative abundance in upper reaches of Deer Creek, and in North Fork Deer Creek, South Fork Deer Creek, and South Fork Sage Creek. Sculpins and other fish species had the greatest relative abundance in lower Deer Creek and in Crow Creek. The greatest number of fish species was captured in Crow Creek. All fish captured at North Fork Deer Creek (n = 12), South Fork Deer Creek (n = 7), and South Fork Sage Creek (n = 8) were YCT. Quantitative analyses (density estimate, etc.) were not conducted for these streams due to low sample numbers and limited and/or sparsely distributed fish habitat. Relative trophic composition was computed for all reaches. Relative trophic composition results indicate that insectivores (i.e., insect eaters) were primarily captured in upper tributary streams, while both insectivores and piscivores (i.e., fish eaters) were captured in lower reaches and in Crow Creek, likely due to the high numbers of brown trout in the sample (Quist et al. 2004).

North Fork Deer Creek
Two sampling reaches (NFDC-200 and NFDC-700) were established on North Fork Deer Creek. No fish were captured in the first pass on NFDC-200. Twelve fish were captured on NFDC-700; all were YCT (**Table 3.8-4**). The population estimate of three fish for YCT, derived from data collected in the depletion unit, was determined to be inconclusive due to the low number of fish captured.

South Fork Deer Creek
Seven YCT were captured in one reach of South Fork Deer Creek (SFDC-100; **Table 3.8-4**). Population estimates were found to be inconclusive.

TABLE 3.8-4 SPECIES COMPOSITION, RELATIVE ABUNDANCE, BIOMASS, AND TROPHIC COMPOSITION FOR STREAMS IN THE STUDY AREA

STREAM SAMPLED		RELATIVE ABUNDANCE (%)[1]						RELATIVE BIOMASS (%)[2,3,4]						TROPHIC COMPOSITION[5]		
STREAM	REACH NUMBER	SPECIES[6]						SPECIES[6]						% OMN[7]	% INS[7]	% PIS[7]
		YCT	BT	SC	DA	WF	BNT	YCT	BT	SC	DA	WF	BNT			
CROW CREEK	CC-100	0.7	---	75.8	---	---	24	0.9	---	17.4	---	---	81.7	---	76	24
	CC-300	1.2	---	64.7	8.9	17.6	7.4	NA	---	NA	NA	NA	NA	---	92.6	7.4
DEER CREEK	DC-100	92.5	7.5	---	---	---	---	NA	NA	---	---	---	---	---	92.5	7.5
	DC-200	100	---	---	---	---	---	100	---	---	---	---	---	---	100	---
	DC-400	23	---	77	---	---	---	32.4	---	67.6	---	---	---	---	100	---
	DC-600	15	---	85	---	---	---	35.9	---	64.1	---	---	---	---	100	---
NORTH FORK DEER CREEK	NFDC-700	100	---	---	---	---	---	100	---	---	---	---	---	---	100	---
SOUTH FORK DEER CREEK	SFDC-100	100	---	---	---	---	---	100	---	---	---	---	---	---	100	---
SOUTH FORK SAGE CREEK	SFSC-SS	100	---	---	---	---	---	100	---	---	---	---	---	---	100	---

1) Relative abundance (%) = Total number of a given species per reach/combined total number of all species per reach or stream segment X 100
2) Relative Biomass (%) = Total weight (g) of a given species per reach/combined total weight (g) all species per reach or stream segment X 100
3) Computation of relative biomass included only fish greater than or equal to 50 mm in length and less than 1000 grams
4) NA = Not available due to absence or unreliability of weight data
5) Relative trophic composition = % of combined trophic categories captured within reach or stream segment
6) YCT= Yellowstone Cutthroat Trout, BT = Brook Trout, SC = Sculpin Spp., DA = Dace spp., WF = Whitefish, BNT = Brown Trout, RT = Rainbow Trout
7) OMN = Omnivorous. INS = Insectivorous. PIS = Piscivorous

South Fork Sage Creek
Depletion pass sampling and determination of fish condition were not conducted on this stream due to a limited availability of suitable fish habitat. However, presence/absence surveys were performed along approximately 1.5 miles of South Fork Sage Creek. Eight fish were captured during this sampling effort; all were YCT (**Table 3.8-4**). Population estimates were found to be inconclusive.

Deer Creek
Four separate sampling reaches were established on Deer Creek; results are summarized in **Tables 3.8-5, 3.8-6**, and **3.8-7**. Sculpin were the most abundant fish species captured, but were only caught in the two lower reaches, DC-400 and DC-600. YCT were captured in all reaches, and there were a small number of brook trout caught in the headwaters (DC-100). IDEQ also performed a presence/absence survey of fish on a section of Deer Creek on 14 August 2003 approximately 300 meters upstream from DC-600; they found YCT and a large number of sculpin (Maxim 2004k). Mean condition factor (K) was at or above 1 for both reaches in which it was calculated, indicating robust populations of YCT and sculpin.

In two reaches of Deer Creek (DC-100 and DC-200), YCT weights were estimated from lengths of individuals using a linear regression on length and weight data collected for YCT in DC-400 and DC-600 (R^2=0.9036; Maxim 2005b). Young-of-year (YOY) fish were included in population parameters and estimates (**Tables 3.8-5** and **3.8-6**) and also treated separately (**Table 3.8-7**). YOY individuals were defined as individuals measuring <35mm in length. Altered abundance of YOY individuals is an early indicator of detrimental effects from disturbance (Maxim 2005b).

TABLE 3.8-5 FISH POPULATION PARAMETERS FOR SAMPLING UNITS OF DEER CREEK

REACH, SPECIES	NUMBER COLLECTED (ALL SIZES)	MEAN LENGTH (MM)	MEAN WEIGHT (G)	MEAN CONDITION (K)
DC-100				
Brook trout	3	167.0	47.7*	NA
YCT	37	89.8	25.9*	NA
DC-200				
YCT	57	115.4	29.9*	NA
DC-400				
YCT	49	56.2	11.6	1.04
Sculpin	164	69.6	7.8	1.74
YCT	95	118.8	21.8	0.977
Sculpin	220	75.2	6.1	NA
DC-600				
YCT	108	95.8	13.6	1.11
Sculpin	613	61.3	4.8	1.65

K = condition factor; * = estimated; NA = Not available due to absence or unreliability of weight data; Shaded area = November 2004 sample (Maxim 2005b).

TABLE 3.8-6 POPULATION AND BIOMASS ESTIMATES FOR QUANTITATIVE SAMPLING UNITS OF DEER CREEK (100-METER DEPLETION SAMPLING UNIT)

REACH, SPECIES	NUMBER COLLECTED	POPULATION ESTIMATE	CI ±	DENSITY ESTIMATE (#/M^2)	FISH PER STREAM MILE	BIOMASS (KG/HA)
DC-100						
YCT	15	15*	1.1	0.042	241	313
DC-200						
YCT	41	42	3.6	0.087	660	654
DC-400						
YCT	28	224	2346.4	0.311	451	704
Sculpin	96	115	22.7	0.160	1,545	749
YCT	13	13	1.3	0.260	209	223
Sculpin	155	199	38.2	3.980	2,494	1,154
DC-600						
YCT	75	141	108.0	0.178	1,207	1,726
Sculpin	359	408	28.2	0.516	5,778	1,820

CI± = Confidence Interval; Shaded area = November 2004 sample (Maxim 2005b); * = estimated.

TABLE 3.8-7 YOUNG-OF-YEAR POPULATION AND BIOMASS ESTIMATES FOR QUANTITATIVE SAMPLING UNITS OF DEER CREEK (100-METER DEPLETION SAMPLING UNIT)

REACH, SPECIES	NUMBER COLLECTED	POPULATION ESTIMATE	CI ±	DENSITY ESTIMATE (#/M2)	FISH PER STREAM MILE	BIOMASS (KG/HA)
DC-200						
YCT	2	2	2	0.004	32	2
DC-400						
YCT	14	112	1,732.4	0.156	225	15
Sculpin	8	8	0.8	0.011	129	4
DC-600						
YCT	16	128	1,638.0	0.162	257	14
Sculpin	36	46	18.6	0.058	579	14

Crow Creek

Two separate sampling reaches were established on Crow Creek; results are summarized in **Tables 3.8-8, 3.8-9**, and **3.8-10**. Crow Creek showed the highest species richness of any stream in the Study Area with five different fish species; brown trout, YCT, sculpin, mountain whitefish, and speckled dace. Numerous size classes of brown trout, sculpin, and dace indicate resident populations within Crow Creek. Mean condition factor calculations for CC-100 indicate that populations of brown trout, YCT, and sculpin are robust (K is approximately equal to or greater than 1).

Weights of brown trout and sculpin in one reach of Crow Creek (CC-300) were estimated from lengths of individuals using linear regression on length and weight data collected in CC-100 (R^2=0.9703 for brown trout and R^2=0.956 for sculpin; Maxim 2005b). YOY fish were included in population parameters and estimates (**Tables 3.8-8** and **3.8-9**) and also treated separately (**Table 3.8-10)**. Only YOY sculpin and dace were captured in Crow Creek.

TABLE 3.8-8 FISH POPULATION PARAMETERS FOR SAMPLING UNITS OF CROW CREEK

REACH, SPECIES	NUMBER COLLECTED (ALL SIZES)	MEAN LENGTH (MM)	MEAN WEIGHT (G)	MEAN CONDITION (K)
CC-100				
Brown trout	72	171.8	199.6	1.24
YCT	2	137.5	25.0	0.96
Sculpin	226	61.7	4.3	1.45
Brown trout	99	155.8	84.2	1.097
Sculpin	528	67.9	4.6	NA
YCT	22	85.7	8.3	0.979
Mountain whitefish	2	298.5	229.5	NA
CC-300				
Brown trout	30	245.9	200.0	NA
YCT	5	232.8	169.6	NA
Speckled dace	36	81.8	20.6	NA
Mountain whitefish	71	296.4	309.6	NA
Sculpin	261	49.7	4.4	NA

K = condition factor, NA = Condition factor unable to be computed due to lack of weight data; Shaded area = November 2004 sample (Maxim 2005b).

TABLE 3.8-9 POPULATION AND BIOMASS ESTIMATES FOR QUANTITATIVE SAMPLING UNITS OF CROW CREEK (100-METER DEPLETION SAMPLING UNIT)

REACH, SPECIES	NUMBER COLLECTED	POPULATION ESTIMATE	CI ±	DENSITY ESTIMATE ($\#/M^2$)	FISH PER STREAM MILE	BIOMASS (KG/HA)
CC-100						
Brown trout	37	39	5.1	0.036	595	10,438
YCT	1	1	3.4	0.001	16	25
Sculpin	107	153	55.1	0.140	1,722	794
Brown trout	49	50	2.8	0.167	789	1,806
Sculpin	346	421	42.9	1.403	5,568	1,979
YCT	8	8	1.0	0.027	129	65
Mountain whitefish	1	1	1.4	0.003	16	259
CC-300						
Brown trout	17	19	6.3	0.014	274	4,632
YCT	4	4	1.9	0.003	64	NA
Speckled dace	24	29	11.8	0.021	386	NA
Mountain whitefish	68	68	1.7	0.050	1,094	NA
Sculpin	137	310	247.2	0.226	2,205	1,737

CI± = Confidence Interval; Shaded area = November 2004 sample (Maxim 2005b).

TABLE 3.8-10 YOUNG-OF-YEAR POPULATION AND BIOMASS ESTIMATES FOR QUANTITATIVE SAMPLING UNITS OF CROW CREEK

(100-METER DEPLETION SAMPLING UNIT)

REACH, SPECIES	NUMBER COLLECTED	POPULATION ESTIMATE	CI ±	DENSITY ESTIMATE (#/M^2)	FISH PER STREAM MILE	BIOMASS (KG/HA)
CC-100						
Sculpin	11	11	0.6	0.010	177	5
CC-300						
Speckled dace	3	3	1.5	0.002	48	NA
Sculpin	79	188	215.5	0.137	1,271	63

Wells Canyon

Maxim sampled Wells Canyon in August of 2003. The only feasible sampling location did not contain appropriate fish habitat (based on water availability, depth, and other factors). A short sampling attempt was made which did not result in any fish captures and the sampling effort was terminated. The likelihood of fish presence in Wells Canyon is low, although possible during certain times of year (i.e., spring).

Manning Creek

Manning Creek was dry at the time of sampling by Maxim for fish (August 2003), as well as during all seven water resources monitoring visits between May 2002 and August 2004 (Maxim 2004d; see **Section 3.3**). Because Manning Creek was dry during monitoring visits by the CNF between May 2002 and August 2004 (see **Section 3.3**); no PFC assessment has been made on this creek. Because YCT and other fish are known to use ephemeral drainages during high water periods (see next section), it is possible that fish are present in Manning Creek when the drainage contains water. However, a flowing connection between Manning Creek and Crow Creek is not a common condition and is expected only during unusual flooding events.

Special Status Species

No Threatened, Endangered, Proposed, or Candidate (TEPC) fish species are known or expected to occur on the CNF (Species List #1-4-05-SP-0354), as identified by the US Fish and Wildlife Service (USFWS). Based on a review of the Idaho Conservation Data Center (CDC) rare species database, the USFS Region 4 Sensitive species list, and other existing data sources, two rare fish species, YCT and northern leatherside chub, have the potential to occur in the Study Area. YCT are Sensitive; northern leatherside chub are designated as Species of Concern by the state of Idaho. The Regional Forester identifies Sensitive species as those for which population viability is a concern, as evidenced by significant current and predicted downward trends in population numbers, density, and/or habitat capability that would reduce a species' existing distribution. Sensitive species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that could result in the need for federal listing (FSM 2672.1). Sensitive fish species potentially occurring on the CNF are listed in **Table 3.8-11**, followed by background information on each species. Additional information can be found in Maxim (2004k).

TABLE 3.8-11 SENSITIVE FISH SPECIES KNOWN OR SUSPECTED TO OCCUR ON THE CNF

COMMON NAME	SPECIFIC NAME	USFS STATUS
Bonneville Cutthroat Trout	*Oncorhynchus clarki utah*	Sensitive
Yellowstone Cutthroat Trout	*Oncorhynchus clarki bouvieri*	Sensitive

Bonneville Cutthroat Trout

Intensive surveys for Bonneville cutthroat trout have been conducted on the CNF since 1998. This subspecies appears to be distributed throughout the southern part of the CNF within the Bonneville Basin, outside of the Study Area. The species is not expected to occur in the Study Area (Maxim 2004k) and is not discussed further in this EIS.

Yellowstone Cutthroat Trout

YCT are the only native trout in the Salt River watershed (Issak 2001). In 1998, the USFWS received a petition to list YCT as "Threatened" under the Endangered Species Act. A 90-day finding was published on 23 February 2001 (66 FR 11244) citing insubstantial information to list, on which a complaint was filed on 20 January 2004. The District Court of Colorado ruled that the USFWS be ordered to produce a 12-month finding. After reviewing all available scientific and commercial information, on 14 February 2006 the USFWS published a 12-month finding concluding that listing the YCT was not warranted (50 CFR Part 17).

YCT are adapted to cold water. Water temperatures between 4.5 and 15.5° C appear to be optimum, although the density response to increasing temperature appears to be nonlinear (Issak and Hubert 2004). YCT individuals can be classified as following one of three main life histories: resident, adfluvial, or fluvial; it is likely that each life history is represented in Southeastern Idaho (Hilderbrand and Kershner 2000, Joyce and Hubert 2004) and probably the Study Area. Following these patterns, some YCT individuals would occupy home ranges entirely within relatively short reaches of streams (resident), migrate as adults from larger streams or rivers to smaller streams to reproduce (fluvial), or exhibit a similar pattern, but migrate (sometimes many kilometers) as mature adults from lakes to inlet or outlet streams to spawn (adfluvial). Documented life history variation in YCT suggests a strong adaptability to disparate environments (Gresswell et al. 1994). One study of four spring streams in the Salt River valley suggests that most spawning in tributary streams was by fish with a fluvial life history, presumably as a response to limited spawning success in the Snake River due to high spring flows and sediment movement (Joyce and Hubert 2004). It is probable that most trout collected in winter from Crow Creek and Deer Creek (by Maxim in January 2006) are resident fish.

YCT spawn exclusively in fluvial environments (Gresswell et al. 1994). Streams selected for spawning are commonly low gradient (up to 3 percent), perennial streams, with groundwater and snow-fed water sources. Spawning occurs where optimal size gravels (10-80 mm in diameter with 5-15 percent fine sediment; see **Appendix 2A**) and optimum water temperatures coexist. Juveniles tend to congregate in shallow, slow-moving parts of the stream (USFS 2003b:D-194).

Some small tributary streams that YCT utilize for spawning are not perennial. In intermittent or ephemeral drainages, spawning can take place during spring runoff or other times when waters are high. Newly hatched fry frequently move to perennial waters just before the natal stream goes dry (Trotter 1987). In northeastern Nevada, Nelson et al. (1987) observed Lahontan cutthroat trout (*O. c. henshawi*) utilizing ephemeral streams to spawn during four years of abnormally high flows, which the authors suggested was a reproductive behavioral plasticity in response to environmental uncertainty and unfavorable conditions such as flooding (Nelson et al. 1987). In coastal habitats, juvenile cutthroat trout were observed using parts of small, ephemeral tributaries year-round (Hartman and Brown 1987). The use of intermittent streams for spawning by YCT is poorly documented, but has been noted in some intermittent tributaries to Yellowstone Lake (Trotter 1987). The use of intermittent streams by fish in the Study Area has not been documented, although intermittent drainage channels in the Study Area could deliver important nutrients, organic matter, or invertebrates to perennial streams (Wipfli and Gregovich 2002, Price et al. 2003, Cummins and Wilzbach 2005).

The YCT occurs in Southeastern Idaho, in tributary rivers to the Snake River above Shoshone Falls. Although YCT distribution has declined substantially in the past 200 years (May et al. 2003), strongholds of YCT exist in at least three major watersheds of the upper Snake River basin (including the Salt watershed).

Intensive surveys for YCT have been conducted on the CNF since 1996. This subspecies appears to be well distributed throughout the parts of the CNF within the Snake River Basin, but populations in various streams or stream segments vary in strength. During fish sampling surveys within the Study Area, YCT were noted in Deer Creek, its North and South forks, South Fork Sage Creek, and Crow Creek (see above survey results). All 6^{th} code HUC's that include streams in the Study Area were rated "strong" (among ratings of "strong," "depressed," or "absent") for YCT distribution by the CNF (USFS 2003b:D-203). Considering the large geographic range of the metapopulation that includes the Salt and upper Snake Rivers, Palisades Reservoir, and all associated tributaries, and considering 35 of the 40 6^{th} code HUC's on the CNF are considered "strong," the Palisades/Salt YCT metapopulation is considered by the CNF to be robust and resilient. Even large, well connected metapopulations, however, are vulnerable to habitat degradation, interactions with nonnatives (i.e., brown, brook, and rainbow trout), or barriers to movement isolating individual segments of the population (Hilderbrand 2003).

Surveys by Issak (see Issak and Hubert 2004) across the Salt River watershed indicated that fish abundance in Crow Creek and tributaries were typical of other streams in the Palisades/Salt River watershed (Meyer and Lamansky 2004). Longitudinal surveys conducted by Meyer et al. (2003) between the 1980s and 1999-2000 indicated that YCT population abundance and distribution in Southeastern Idaho has not changed substantially between the two collection periods (Meyer et al. 2003). In the Study Area, YCT density has increased (**Table 3.8-12**).

TABLE 3.8-12 COMPARISON OF YCT ABUNDANCE IN THE STUDY AREA BETWEEN THE 1980'S AND 1999-2000 (MEYER ET AL. 2003)

Stream	Site #	1980's # YCT	1999-2000 # YCT
Crow Creek	M-CC01	4	10
Crow Creek	M-CC02	84	117
Deer Creek	M-DC01	19	31
Sage Creek	M-SC01	37	79

Allopatric cutthroat trout populations (where cutthroat are the only species present) are found almost exclusively in reaches at high elevations (Quist et al. 2004). Other species of trout (i.e., nonnatives) may be found in the same reaches as native cutthroat at lower elevations. Although cutthroat-rainbow trout hybrids were initially recorded in Crow Creek (Maxim 2004k), genetic analysis of 45 cutthroat captured in North Fork Deer Creek, Deer Creek, and Crow Creek concluded that all trout sampled were pure-strain YCT, indicating that there is no rainbow trout introgression into the YCT populations within the upper Crow Creek drainage (Maxim 2006). Meyer et al. (2003) also found a zero rate of genetic introgression in their sample of 44 YCT from Crow Creek. One rainbow trout hybrid was visually identified in Deer Creek (Meyer et al. 2003). Regarding introgression over time across Idaho, Meyer et al. conclude that YCT abundance, distribution, and stock structure have remained relatively unchanged from the 1980s to 1999-2000 at a large number of locations across the historic range of YCT.

3.8.4 Abiotic Condition

Stream reference reaches were located and established along Crow Creek (two), South Fork Sage Creek (two), Deer Creek (four), North Fork Deer Creek (two), South Fork Deer Creek (one), and Wells Canyon (one, see Maxim 2004k). Stream cross-sections and longitudinal profiles were measured, and stream morphology characteristics were either measured or evaluated in the field for each of the 12 reaches. As part of the longitudinal surveys, an R4 Level I fish habitat inventory was also conducted in each reach. Field methods employed were in accordance with protocols provided by Overton et al. (1997). Habitat inventories involved defining habitat type; measuring length, width, and depth of pool/riffle/run features; and identifying streambed materials.

A wide variety of channel types, patterns, and habitats were observed within the Study Area. The majority of reaches were determined to consist of stable meander riffle-pool channels, with the exception of two sites within Deer Creek (DC-100 and DC-400) and two within North Fork Deer Creek (NFDC-200 and NFDC-700) that exhibited a potentially more sensitive degrading channel. Large woody debris recruitment potential throughout the Study Area was observed to be low to none except within the upper South Fork Sage Creek drainage. Bank vegetation consisted of various shrubs and grasses, frequently providing ample cover for aquatic life, and channels within the Study Area appear to be capable of handling a wide range of flows.

Substrate Composition

Substrate composition, specifically the relative amount of fine sediment, directly affects habitat complexity as fine sediments fill in bed features and pools. The filling in of bed features reduces populations of macroinvertebrates and reduces the suitability of the habitat for fish. Trout reproduction in particular is highly dependent on substrate composition, as egg mortality is directly related to the proportion of fine sediment to gravel (see **Appendix 3B**). Sedimentation into a stream from road or culvert construction can thus reduce or eliminate the possibility that trout will find the local area suitable for spawning. Sedimentation effects can also spread downstream from a local disturbance. Ideal conditions for cutthroat trout spawning consist of approximately 5-15 percent fine sediment (particles <6 mm), with the majority of gravels being 10-80 cm in diameter. Trout are more likely to spawn in habitats characterized by faster-moving water because currents must be strong enough to carry fines downstream as they are cleared from the nest during redd development, as well as oxygenate eggs (Chapman 1988).

Substrate composition, or the relative proportions of fine sediment, gravels, cobbles, and larger rocks on the stream bottom, was evaluated in each stream reference reach. All stream reference reaches were first divided into habitat types (i.e., pool, riffle, or run; Maxim 2005b), then substrate composition was evaluated within each area of the reach. For simplicity, the categories of small gravel (2-8 mm), cobble (128-256 mm), and small boulders (>256 mm) were eliminated from this analysis because less than 9 percent of the total areas evaluated (n = 267) contained any substrate within these ranges (see Maxim 2005b for complete data). Wells Canyon (WC-900) substrate was determined to contain 100 percent fine sediment throughout (Maxim 2005b) and was eliminated from further analysis. This substrate composition and the lack of fish observed during baseline surveys in Wells Canyon eliminate the possibility that this reach contains suitable spawning habitat for trout.

The majority of the stream reference reaches evaluated by Maxim contained a mixture of fines (particles <2 mm in diameter), gravels (8-64 mm), and small cobbles (64-128 mm). Concerning spawning habitat, "riffles," which include pool tailouts, evaluated in the Study Area contained an average of 12 percent fines (range = 0-68%; **Table 3.8-13**). In their proper functioning analysis of riparian habitats, Maxim rated Crow Creek, Deer Creek, and Deer Creek tributaries as functioning-at-risk. South Fork Sage Creek was rated as properly functioning (**Section 3.5**; Maxim 2004e).

<u>Crow Creek</u>

The average proportion of fine sediment in Crow Creek substrates (reaches CC-100 and CC-300) is 15-16 percent across all habitat types. There were no (0 percent) fine sediments in riffle habitats within either reach, and both reaches contained an adequate mean proportion of gravels (**Table 3.8-13**). Reach CC-100 also has relatively high-quality spawning habitat in run habitats whereas reach CC-300 does not (**Table 3.8-13**). Outside of run habitat in CC-300, the quality of potential spawning habitat in Crow Creek appears to be relatively high and resilient to small increases in fine sediment.

<u>Deer Creek</u>

Across habitat types, the average proportion of fine sediment in Deer Creek substrates (reaches DC-100, DC-200, DC-400, and DC-600) ranges from 3-33 percent. Average percent fines range from 0-2 percent in riffle habitats across all four reaches (**Table 3.8-13**). Although the mean proportions of gravels across riffles in Deer Creek reaches DC-200 and DC-600 are not ideal for spawning (i.e., not the majority substrate), the quality of potential spawning habitat in some areas of Deer Creek is relatively high due to the low level of fine sediment in DC-100 and DC-400 riffles.

<u>North Fork Deer Creek</u>

Across all habitat types, the average proportion of fine sediments in North Fork Deer Creek substrates (reaches NFDC-200 and NFDC-700) ranges from 17-31 percent. Riffle habitats in these reaches range from marginal (fines = 20 percent in NFDC-700) to unsuitable (fines = 39 percent in NFDC-200) for spawning (**Table 3.8-13**). Run habitats in North Fork Deer Creek may provide marginal spawning habitat, although average fines in runs for both reaches are greater than 15 percent. The overall quality of potential spawning habitat in North Fork Deer Creek appears to be relatively low and vulnerable to further degradation from small increases in fine sediment.

TABLE 3.8-13 SUBSTRATE COMPOSITION SUMMARY

REACH	HABITAT TYPE* (N)	MEAN % FINES (<2MM)	MEAN % GRAVEL (8-64MM)	MEAN % SMALL COBBLE (64-128 MM)
CC-100	Pool (8)	38	63	0
	Riffle (9)	0	78	22
	Run (5)	12	64	16
CC-300	Pool (6)	20	40	40
	Riffle (6)	0	60	40
	HG Riffle (1)	0	0	0
	Run (3)	40	0	60
DC-100	Pool (17)	51	44	6
	Riffle (3)	0	40	47
	HG Riffle (3)	13	60	27
	Run (12)	13	77	10
DC-200	Pool (12)	8	29	33
	Riffle (13)	0	26	68
	Run (5)	0	20	76
DC-400	Pool (9)	53	38	7
	Riffle (9)	2	38	60
	Run (6)	47	48	3
DC-600	Pool (7)	24	51	24
	Riffle (7)	1	14	84
	HG Riffle (2)	0	5	40
	Run (2)	0	15	85
NFDC-200	Pool (5)	36	35	36
	Riffle (11)	39	48	13
	HG Riffle (4)	13	26	60
	Run (3)	17	50	33
NFDC-700	Pool (7)	11	86	3
	Riffle (11)	20	47	33
	HG Riffle (2)	5	15	80
	Run (3)	27	60	13
SFDC-100	Pool (7)	89	11	0
	Riffle (5)	68	32	0
	HG Riffle (1)	90	10	0
	Run (4)	95	5	0
SFSC-500	Pool (13)	46	22	17
	Riffle (12)	0	70	30
	HG Riffle (1)	0	60	40
	Run (4)	0	90	10
SFSC-700	Pool (13)	43	14	38
	Riffle (1)	0	60	40
	HG Riffle (13)	5	48	45
	Run (2)	80	20	0
TOTAL	**(267)**	**24**	**42**	**29**

*The relatively rare "cascade" habitat type was eliminated from this analysis; HG=high gradient.

South Fork Deer Creek

The South Fork Deer Creek reach evaluated by Maxim (SFDC-100) is currently constrained by a dirt road and does not contain suitable spawning habitat. Mean sediment content is greater than 60 percent in riffle habitats, the most likely area for spawning (**Table 3.8-13**). The perennial reach of South Fork Deer Creek lies mainly upstream from a culvert proposed under the Proposed Action West Haul Road. The overall quality of potential spawning habitat in South

Fork Deer Creek appears to be relatively low and vulnerable to further degradation from small increases in fine sediment.

South Fork Sage Creek
The average proportion of fine sediment in South Fork Sage Creek substrates (reaches SFSC-500 and SFSC-700) ranges from 20-27 percent across all habitat types. There were no fine sediments in riffle habitats within either reach (**Table 3.8-13**). These are suitable conditions for trout reproduction considering South Fork Sage Creek riffles also contain a high mean proportion of gravels (**Table 3.8-13**). Outside of run habitats in SFSC-700, habitat quality in South Fork Sage Creek reaches may be relatively robust in the face of small sediment increases.

3.8.5 Trace Elements

Selenium
Background
Selenium has two separate modes of toxicity, acute (via water, occurring at relatively high concentrations), and chronic (via dietary exposure, occurring due to accumulation and maternal transfer of organic selenium into eggs). The behavior of selenium in streams is described in **Appendix 3C**.

Selenium concentrations in fish have been shown to follow a similar pattern of accumulation as observed in stream sediments, aquatic plants, and aquatic invertebrates. Studies show that fish bioaccumulate selenium primarily via ingestion (Hamilton et al. 2004; Hamilton 2004 provides a review; also **Appendix 3C**). Invertebrates and plants can concentrate dissolved selenium from the water, and this selenium can then be part of the food base for fish feeding in contaminated reaches of streams. The effect of this dissolved selenium on the ecosystem would be expected to vary with the selenium concentration in the water. Studies conducted in Southeastern Idaho have shown that dissolved selenium concentrations downstream from phosphate mining sources do vary seasonally, peaking during spring runoff and decreasing during low-flow periods (Presser et al. 2004). Selenium that is initially released to streams as dissolved compounds or particulates can also be removed from the water through chemical and microbial reduction, adsorption to clay and organic detritus, reaction with iron, precipitation, co-precipitation, and settling. As the flow of selenium progresses downstream, selenium is expected to migrate with varying rates of uptake by organisms, depending on physical retention and bio-availability (discussed in **Appendix 3C**). The eventual location for this selenium may be in the bottom sediment of surface streams where it may be perennially available for bioaccumulation in plants, benthic invertebrates, and fish, even though selenium concentrations in the water may seasonally be less than published aquatic life toxicity thresholds for selenium concentrations in water (2 to 5 µg/L, USDI 1998 and 5 µg/L, EPA 1987). The bioaccumulation process occurs via a complex series of interconnected hydrogeological, biogeochemical, and biological pathways that vary over time, among sites, and among receptor taxa. Each variable is presented and analyzed in **Appendix 3C**.

Several published studies exist regarding selenium impacts upon coldwater species (reviewed in **Appendix 3C**). Hilton et al. (1980) determined that uptake and accumulation in tissues of trout reared on diets containing in excess of 3 µg/g dry feed may ultimately be toxic to trout if maintained over a long period of time. Hodson et al. (1980) observed significant mortality of eyed eggs at selenium concentrations greater than 28 µg/L and decreased cellular blood iron concentrations at 16 µg/L. As a conclusion of their study, Hunn et al. (1987) recommended a safe level of 10 µg/L for inorganic selenium, but suggest that concentrations near this level can reduce levels of calcium in the backbones of trout. **Appendix 3C** reviews studies on acute and chronic toxicity of selenium associated with waterborne exposures, dietary exposures, maternal transfer, and field studies, in addition to potential differences in selenium toxicity between warm water and cold water fish species. In a recent unpublished study, long term population simulations based on individual-level salmonid responses to selenium by Van Kirk and Hill (2006) further illustrate how population-level effects may require higher selenium exposures than individual effects do.

From studies of warm water fish in closed basins, Lemly (1993a, 2002) proposed a biological effect value of 4.0 mg/Kg dw in whole body tissue concentrations for selenium, at which mortality of juvenile fish and reproductive failure of adults occurs (Lemly 2002). Hamilton (2002) also used this value, and Maier and Knight (1994) proposed a similar value (4.5 mg/Kg dw selenium). Deforest et al. (1999) proposed whole-body guidelines of 6.0 and 9.0 mg/Kg dw for cold-water anadromous and warmwater fish, respectively. The EPA has proposed that aquatic life should be protected such that concentrations of selenium in whole-body fish tissues do not exceed 7.9 mg/Kg dw (GLEC 2002). This value, if finalized, will supersede previous aquatic life water quality criteria for selenium used by the EPA and will be used to establish water quality standards under the Clean Water Act for the protection of aquatic life from the toxic effects of selenium. **Appendix 3C** describes the ongoing debate regarding the derivation of a whole-body fish tissue threshold value. It is important to note that currently there are no regulatory limits on selenium regarding dietary toxicity in fish or reproductive effects; only a range of thresholds proposed in the literature.

McDonald and Chapman (2007) propose an assessment framework that incorporates fish tissue residue guidelines as well as determinations of reproductive effects and studies of fish populations themselves. Their framework applies these three lines of evidence in a tiered manner to produce a “weight of evidence” determination of selenium hazard.

<u>Analyses of fish tissues - Maxim</u>
Maxim obtained fish collection permits from IDFG to analyze fish tissues for selenium and cadmium in the summer of 2003 and winter of 2006. Fish from various size classes were collected from South Fork Sage Creek, South Fork Deer Creek, main stem Deer Creek, North Fork Deer Creek, and Crow Creek during electrofishing surveys, and analyzed for whole body concentrations of selenium and cadmium. Samples were stored in coolers in the field and frozen within 12 hours of collection, then submitted to Silver Valley Laboratory (SVL) in Kellogg, Idaho for analysis. Laboratory protocols for analyses of fish tissue for selenium are contained in the Plan of Study for Fisheries and Aquatic Resources (Maxim 2003c); QA/QC data are contained in the Project Record and are available to the public upon request. In the fall of 2005, the Greater Yellowstone Coalition (GYC) also performed selenium analyses of fish tissues in the Study Area. These data were collected following USGS protocol and analyzed at a USGS laboratory; the USFS and BLM were not involved in the chain of custody of the GYC samples. Thus, the GYC data were collected and analyzed under a different set of protocols than the baseline data collected by Maxim and should be compared to the Maxim data with these differences in mind.

In the summer of 2003, fish sampled by Maxim from portions of South Fork Sage Creek and South Fork Deer Creek were found to have selenium tissue concentrations below the biological effect threshold value of 4.0 mg/Kg (**Table 3.8-14**). Most fish analyzed from North Fork Deer Creek, Deer Creek, and Crow Creek had levels of selenium that exceeded the threshold in both the summer of 2003 and winter of 2006. Elevated selenium values observed in fish from the undisturbed North Fork Deer Creek and Deer Creek suggest that fish in these streams may already be affected by exposure to natural sources of selenium unrelated to mining activities. Many fish collected were also above the EPA's draft chronic exposure value (7.9 mg/Kg). Noticeable variation in the concentrations of selenium in YCT can be seen in **Table 3.8-14**.

TABLE 3.8-14 TRACE ELEMENT ANALYSIS SUMMARY FOR FISH (MAXIM*)

Location	Date	Species	Length (mm)	Weight (g)	Selenium mg/Kg dw	Cadmium mg/Kg dw
South Fork Sage Creek						
SFSC-SS-B	Aug 2003	YCT	126	20	2.6	0.26
SFSC-SS-B	Aug 2003	YCT	178	70	2.5	0.25
SFSC-SS-B	Aug 2003	YCT	191	80	2.2	0.16
North Fork Deer Creek						
NFDC-700	Aug 2003	YCT	113	15	3.6	0.51
NFDC-700	Aug 2003	YCT	115	16	5.0	0.48
NFDC-700	Aug 2003	YCT	240	170	7.1	0.26
NFDC-700	Jan 2006	YCT	198	78	12.4	0.28
NFDC-700	Jan 2006	YCT	179	49	6.7	0.16
NFDC-700	Jan 2006	YCT	170	42	4.0	0.19
NFDC-700	Jan 2006	YCT	68	3	0.2	0.09
NFDC-700	Jan 2006	YCT	67	2	0.1	0.04
Deer Creek, Mainstem						
DC-100	Aug 2003	YCT	240	170	0.76	0.27
DC-200	Aug 2003	YCT	116	20	0.57	5.9**
DC-200	Aug 2003	YCT	178	60	0.34	0.37
DC-200	Aug 2003	YCT	220	115	0.42	0.19
DC-400	Aug 2003	Sculpin	85	10	0.7	0.32
DC-400	Aug 2003	Sculpin	90	10.5	6.4	0.63
DC-400	Aug 2003	Sculpin	100	13	5.8	0.75
DC-400	Aug 2003	YCT	120	15	0.48	0.27
DC-400	Aug 2003	YCT	130	20	0.8	0.21
DC-400	Aug 2003	YCT	230	120	0.64	0.29
DC-400	Jan 2006	YCT	200	80	13.0	0.16
DC-400	Jan 2006	YCT	198	67	0.8	0.22
DC-400	Jan 2006	YCT	160	38	7.7	0.33
DC-400	Jan 2006	YCT	145	28	1.3	0.19
DC-400	Jan 2006	YCT	141	23	1.9	0.30
DC-400	Jan 2006	YCT	128	21	8.5	0.27
DC-400	Jan 2006	YCT	125	16	7.2	0.19
DC-400	Jan 2006	YCT	124	20	7.8	0.20
DC-400	Jan 2006	YCT	122	15	8.2	0.21
DC-400	Jan 2006	YCT	104	10	1.9	0.22
DC-400	Jan 2006	YCT	85	7	7.9	0.31
DC-400	Jan 2006	YCT	58	2	1.3	0.09
DC-400	Jan 2006	Paiute sculpin	118	24	13.6	0.19
DC-400	Jan 2006	Paiute sculpin	109	18	7.7	0.36

Location	Date	Species	Length (mm)	Weight (g)	Selenium mg/Kg dw	Cadmium mg/Kg dw
DC-400	Jan 2006	Paiute sculpin	108	20	8.8	0.18
DC-400	Jan 2006	Paiute sculpin	88	8	9.4	0.20
DC-400	Jan 2006	Paiute sculpin	86	7	5.1	0.51
DC-600	Jan 2006	YCT	205	82	8.6	0.17
DC-600	Jan 2006	YCT	200	78	6.9	0.23
DC-600	Jan 2006	YCT	200	72	8.6	0.18
DC-600	Jan 2006	YCT	195	71	9.7	0.18
DC-600	Jan 2006	YCT	195	71	7.5	0.25
DC-600	Jan 2006	YCT	175	47	5.5	0.66
DC-600	Jan 2006	YCT	170	48	2.1	0.18
DC-600	Jan 2006	YCT	152	35	9.1	0.90
DC-600	Jan 2006	YCT	149	35	6.5	0.19
DC-600	Jan 2006	YCT	145	25	6.4	0.24
DC-600	Jan 2006	Paiute sculpin	100	14	0.5	0.21
DC-600	Jan 2006	Paiute sculpin	95	12	9.1	0.18
DC-600	Jan 2006	Paiute sculpin	90	9	4.0	0.24
DC-600	Jan 2006	Paiute sculpin	90	8	6.9	0.34
DC-600	Jan 2006	Paiute sculpin	86	7	7.5	0.20
DC-600	Jan 2006	Paiute sculpin	82	7	5.3	0.21
DC-600	Jan 2006	Paiute sculpin	80	5	7.3	0.37
DC-600	Jan 2006	Paiute sculpin	77	6	7.8	0.28
DC-600	Jan 2006	Paiute sculpin	76	6	8.8	0.23
South Fork Deer Creek						
SFDC-100	Aug 2003	YCT	105	13	2.3	0.07
SFDC-100	Aug 2003	YCT	130	24	1.9	0.04
SFDC-100	Aug 2003	YCT	165	51	2.7	0.06
Crow Creek						
CC-100	Aug 2003	Sculpin	75	5.3	4.7	0.12
CC-100	Aug 2003	Sculpin	75	5.3	3.9	0.27
CC-100	Aug 2003	Sculpin	75	5.3	6.5	0.29
CC-100	Aug 2003	Brown trout	320	1000	4.6	0.2
CC-100	Aug 2003	Brown trout	370	1000	6.7	0.12
CC-300	Aug 2003	Brown trout	315	360	5.4	0.03
CC-300	Aug 2003	Mountain whitefish	352	500	5.0	0.03
CC-100	Jan 2006	YCT	251	154	6.3	0.25
CC-100	Jan 2006	YCT	225	113	8.2	0.31
CC-100	Jan 2006	YCT	218	96	4.7	0.21
CC-100	Jan 2006	YCT	215	103	4.7	0.16
CC-100	Jan 2006	YCT	208	78	5.1	0.27
CC-100	Jan 2006	YCT	196	64	6.2	0.19
CC-100	Jan 2006	Paiute sculpin	121	27	7.4	0.19
CC-100	Jan 2006	Paiute sculpin	115	24	4.9	0.19
CC-100	Jan 2006	Paiute sculpin	113	21	8.3	0.20

Location	Date	Species	Length (mm)	Weight (g)	Selenium mg/Kg dw	Cadmium mg/Kg dw
CC-100	Jan 2006	Paiute sculpin	112	14	7.9	0.62
CC-100	Jan 2006	Paiute sculpin	106	17	5.6	0.36
CC-100	Jan 2006	Paiute sculpin	100	14	5.1	0.20
CC-100	Jan 2006	Paiute sculpin	97	13	7.2	0.19
CC-100	Jan 2006	Paiute sculpin	90	10	6.8	0.21
CC-100	Jan 2006	Paiute sculpin	84	9	5.9	0.21
CC-100	Jan 2006	Paiute sculpin	78	6	3.7	0.26
CC-100	Jan 2006	Paiute sculpin	76	6	6.9	0.18
CC-300	Jan 2006	YCT	250	141	6.0	0.16
CC-300	Jan 2006	YCT	238	110	4.9	0.18
CC-300	Jan 2006	YCT	225	106	6.8	0.17
CC-300	Jan 2006	YCT	210	79	8.3	0.21
CC-300	Jan 2006	YCT	210	90	3.5	0.16
CC-300	Jan 2006	YCT	176	40	6.7	0.19
CC-300	Jan 2006	YCT	130	18	5.6	0.18
CC-300	Jan 2006	YCT	108	10	6.1	0.23
CC-300	Jan 2006	YCT	76	3	0.2	0.04
CC-300	Jan 2006	Paiute sculpin	100	16	4.5	0.26
CC-300	Jan 2006	Paiute sculpin	92	9	7.1	0.21
CC-300	Jan 2006	Paiute sculpin	91	11	9.5	0.20
CC-300	Jan 2006	Paiute sculpin	84	7	7.7	0.21
CC-300	Jan 2006	Paiute sculpin	82	7	4.3	0.24
CC-300	Jan 2006	Paiute sculpin	82	8	6.5	0.22
CC-300	Jan 2006	Paiute sculpin	81	6	10.9	0.23
CC-300	Jan 2006	Paiute sculpin	80	7	9.5	0.23
CC-300	Jan 2006	Paiute sculpin	79	6	9.0	0.25
CC-300	Jan 2006	Paiute sculpin	79	6	5.8	0.25
CC-300	Jan 2006	Paiute sculpin	75	5	8.1	0.22
CC-300	Jan 2006	Paiute sculpin	61	4	6.7	0.25

Shading = Value exceeds proposed Biological Effect Threshold of 4.0 mg/kg dry weight for fish tissue.
*Data compiled from Maxim 2004k and Maxim 2006.
**This fish was re-analyzed by Silver Valley Laboratory and results of the second analysis were similar to the first. This fish appears to be an anomaly.

Fish migratory behavior, particularly in YCT, may explain some differences in selenium concentrations within tissues. YCT could move from areas of relatively lower or higher selenium concentrations and thus show different tissue concentrations than resident species. The confounding factor of fish movement can be clarified somewhat by the selenium levels found in sculpin tissue. Sculpin, which do not normally migrate great distances (Petty and Grossman 2004), and show population dynamics determined largely by small-scale phenomena (Grossman et al. 2006), also have elevated selenium concentrations in Deer Creek. It is likely, therefore, that selenium levels in sculpin do represent conditions in an unimpacted stream setting such as Deer Creek, and Crow Creek above Sage Creek (Maxim 2006). The selenium content in tissues of YCT and sculpin in January 2006 were not significantly different in either reach of Deer Creek in which there was an adequate sample size to test (Using Mann-Whitney U tests, DC-400: N = 17, U = 45.5, p = 0.13; DC-600: N = 19, U = 39.5, p = 0.72).

Other Analyses

Recent studies have been conducted to determine selenium concentrations and other trace elements in water, stream bottom sediment, aquatic plants, aquatic invertebrates, and fish from streams in southeastern Idaho near phosphate mining areas (e.g., Hamilton and Buhl 2003; Hamilton et al. 2004; GYC 2005; NewFields 2005b). Selenium data derived from samples of fish tissue, macroinvertebrates, sediment, or water have been reported in the Blackfoot River watershed, in upper and lower East Mill Creek and Dry Valley Creek (Hamilton et al. 2004), as well as in the Salt River and Bear River watersheds within Blackfoot River, State Land Creek, upper and lower Georgetown Creek, Deer Creek, and Crow Creek (Hamilton and Buhl 2003).

In the spring of 2001, Hamilton et al. (2002) sampled selenium levels on Deer Creek (DC), 0.5 km upstream from its confluence with Crow Creek, and on Crow Creek (CC), just upstream of its confluence with Deer Creek. Selenium concentrations in water were below their detection levels (0.002 mg/l). Sediment levels were reported as 4.5 mg/Kg for DC and 2.1 mg/Kg for CC. Selenium concentrations in whole-body fish tissue were reported as 11.5 mg/Kg for DC and 10.4 mg/Kg for CC. Selenium concentrations in aquatic plants were 4.3 mg/Kg and 4.6 mg/Kg for DC and CC, respectively, and in aquatic invertebrates were 8.7 mg/Kg and 6.7 mg/Kg for DC and CC, respectively. Their results indicated a statistically significant correlation between selenium concentrations in aquatic plants and invertebrates and between selenium concentrations in aquatic invertebrates and fish. Hamilton et al. (2002) concluded that selenium bioaccumulation in aquatic plants lead to bioaccumulation in aquatic invertebrates, which resulted in elevated concentrations in fish.

The mean selenium concentration in fish tissue assessed by IDEQ in 2001 in upper and lower East Mill Creek (3 sample locations) was 20.7 mg/Kg (TtEMI 2002d), and by Montgomery Watson was 24 mg/Kg (Montgomery Watson 1999), exceeding the proposed biological threshold. Although still above the threshold, fish in the Salt River watershed (including two sample locations in Sage Creek) had a much lower mean selenium concentration of 8.2 mg/Kg (TtEMI 2002d). NewFields' fish samples at five out of six sites in Sage Creek were below the threshold (NewFields 2005b). Moreover, NewFields' Sage Creek and South Fork Sage Creek samples both up- and downstream of Panel D and E mining activities, respectively, were below the threshold. The finding of elevated selenium in Deer and upper Crow Creek, where mining activities have not yet taken place, implies that these selenium levels have accumulated via erosion of naturally occurring Meade Peak shales in these watersheds (see **Sections 3.3.2** and **4.3.2**).

GYC data indicate high selenium levels in both Deer Creek and areas downstream of impacted sites (Sage and Crow Creeks; **Table 3.8-15**; see **Figure 3.8-1** for survey locations).

In general, differences in selenium concentrations among YCT samples by different organizations can be accounted for in many ways, in addition to potential data quality control, including collecting at different times of the year (difference in flows), differing life history patterns of fish (resident vs. migratory), or differing sex or age classes. An interagency group is currently developing a standardized selenium sampling protocol to address the discrepancies in past sampling and sample analysis in the Project Area (see **Section 4.8.2**).

TABLE 3.8-15 TRACE ELEMENT ANALYSIS SUMMARY FOR FISH (GYC)

LOCATION	DATE	SPECIES	LENGTH (MM)	SELENIUM (µG/G DW)
GYC-4 (Deer)	July 2005	YCT	100-109	18.00
GYC-4 (Deer)	July 2005	Sculpin	--	11.60
GYC-4 (Deer)	July 2005	Sculpin	--	32.30
GYC-5 (Crow)	July 2005	YCT	210-219	7.40
GYC-5 (Crow)	July 2005	Sculpin	--	9.23
GYC-5 (Crow)	July 2005	Dace	--	7.33
GYC-6 (Sage)	July 2005	Sculpin	--	20.70
GYC-D (Sage)	July 2005	Sculpin	--	34.90
GYC-6 (Sage)	July 2005	Brown trout	240-249	18.40
GYC-7 (Crow)	July 2005	Whitefish	--	12.40
GYC-7 (Crow)	July 2005	Dace	--	21.20
GYC-7 (Crow)	July 2005	Brown trout	170-179	10.80

Shading = Value exceeds proposed Biological Effect Threshold of 4.0 mg/kg dry weight for fish tissue

Winter Stress Syndrome

Some evidence suggests that a stress response may be induced in cold-water salmonids as a result of exposure to a stressor such as selenium (e.g., Hodson et al. 1980, Miller et al. 2006; see **Appendix 3C**), and studies on warm water fish species show that fish may undergo such stress in winter and that this may compound the stress effects of selenium and amplify the overall adverse effects to fish. Fish will likely undergo selenium-induced Winter Stress Syndrome (WSS) if they 1) require more energy (experience a stress response) when exposed to elevated selenium, and 2) if they reduce feeding and activity during cold weather. Limited evidence suggests that a WSS response may be induced in cold-water salmonids as a result of selenium exposure; however, there are insufficient data to determine the magnitude, if any, of the response. Lemly's (1993b) study with bluegill sunfish is currently the only experimental demonstration of WSS; additional laboratory investigations by the EPA designed to replicate this study are still in the planning phase. Winter stress syndrome is addressed in more detail in **Appendix 3C**.

Baseline Risk Assessment

Selenium residues in most salmonids sampled within the phosphate mining area were above concentrations found to cause adverse effects in early life stages of fish, including salmonids (4.5 mg/Kg; Hamilton et al. 2000). Lemly (1999) documented reproductive failure and teratogenic deformities in other fish (not trout) living in waters with levels of selenium twice the IDEQ removal action level (0.01 mg/L). Baseline studies indicate that the elevated selenium concentrations in the Study Area have apparently not had population level effects. Deer Creek in particular is considered unimpacted with regard to mining, has a healthy fishery, and yet aquatic media show moderate to high selenium contamination. This could be explained by any number of density dependent mortality or other population effects, including the hypothesized natural tolerance of high selenium levels by cutthroat trout (see **Appendix 3C**).

Appendix 3C contains a summary of key studies that have been conducted to investigate the toxicity of selenium in freshwater fish, including information on the acute and chronic toxicity of selenium associated with waterborne exposures, dietary exposures, and maternal transfer; and field studies. The differences in selenium toxicity between warm-water and cold-water fish are also considered, as Lemly's studies are based on warm-water fish having possibly different physiologies and tolerances than fish in the Study Area. There are no published dietary selenium exposure studies using cutthroat trout. Hardy's (2005) study is not considered here because his methods were not subject to peer review and have been called into question by the agencies and numerous reviewers. See **Appendix 3C** for a discussion.

Regarding human health, an advisory was issued in the fall of 2002 by the Idaho Division of Health recommending limited consumption of fish from East Mill Creek by children based upon elevated selenium concentrations in edible fish tissue. Their exposure calculations indicated a potential risk to child subsistence level users, although they agreed that subsistence use of this area is considered highly unlikely. Under the child subsistence lifestyle scenario, it is assumed that the receptor lives near the impacted media and that the only source of some component of their diet is from a single area over an extended period, assumed to be six years for a child. East Mill Creek is not in the Study Area, and would not be impacted by the Proposed Action.

Consumption of fish and elk in the Southeastern Idaho phosphate mining area by the recreational user was evaluated in the Area Wide Human Health and Ecological Risk Assessment (TtEMI 2002d). The risk assessment calculated a hazard index of less than 1.0 for the adult recreationalist, indicating no adverse health effects were expected. The child recreationalist hazard index was 2.0 for ingestion of aquatic life but less than 1.0 for elk consumption. Based on fish sampled from East Mill Creek, a hazard index of greater than one indicates a potential for adverse noncarcinogenic health effects.

As described in **Section 4.3**, the culinary well at Smoky Canyon Mine was impacted in early 2005, but has since returned to levels below state and federal standards (approximately 20 ppb).

Cadmium

Fish that were analyzed for whole body selenium concentrations were also analyzed for whole body cadmium concentrations. IDEQ has proposed a cadmium removal action level for sediments supporting aquatic life of 5.1 mg/Kg dw for aquatic life (IDEQ 2005b). These action levels have been established to identify impacted areas, uncontrolled release areas, and those that are in violation of federal or state law. The majority of fish that were sampled within the Study Area were below the proposed threshold value. One exception was a fish collected from DC-200 with a cadmium concentration of 5.9 mg/Kg dw, which appears to be an anomaly.

3.9 Grazing Management

Livestock grazing has been a historic and traditional use of CNF lands in and around the Study Area. Sheep were brought into the area as early as the 1830s-1840s by missionaries and emigrants (Fiori 1981: 145-146). Small herds of cattle were driven into the region during the 1860s. Evidence of historic livestock grazing is still present within the Project Area, as described further in the Cultural Resources section (**Section 3.13**) of this EIS.

The Baseline Technical Report for Land Use, Access, Recreation, and Grazing (Maxim 2004g) that was prepared for use in this EIS describes various laws, regulations, and policies that authorize grazing and set forth grazing management strategies. Forest Service Handbook 2209 (USFS 2004b) forms the basis for the grazing administration program, including developing permit terms and conditions. For the CNF, grazing management strategies are incorporated into the RFP (USFS 2003a) through the identification of management prescriptions, such as Prescription 2.8.3 *Aquatic Influence Zones*, which includes livestock grazing standards and guidelines for riparian areas. Under *Grazing Management*, the RFP includes the goal of providing "opportunities for livestock grazing within the capability and suitability of the land and in coordination with other resources goals."

There are seven range allotments on CNF lands (or portions of allotments) in the Study Area: Manning Creek Sheep Allotment, Deer Creek Sheep Allotment, Green Mountain Sheep Allotment, Sage Creek Sheep Allotment, Sage Valley Allotment, Lower Crow Creek Allotment, and Wells Canyon Allotment. **Figure 3.9-1** shows the allotment boundaries and range improvements, and **Table 3.9-1** provides allotment information on suitable acreage, range improvements, and stocking rates as well as other relevant notes. Most of this information was compiled by Maxim (2004g); the Lower Crow Creek Allotment information came directly from the CTNF. These allotments consist of varying proportions of the following vegetation community types: aspen, aspen/conifer, conifer, grass/shrub, mahogany, and riparian. Additional allotment details can be found in Maxim (2004g).

On CNF lands, the suitability of land within an allotment for grazing either cattle or sheep refers to whether it is compatible with management direction for a management area's other uses and values. It represents the integration of rangeland capability (the biophysical characteristics conducive to livestock grazing) and appropriateness of grazing livestock on a particular area, considering economics, social concerns, and compatibility with other land uses. For the CNF, capability was assessed based upon topographic slope, distance from water, and vegetative cover type. Suitable acres can change over time or with different management options. The suitable acreage numbers used in this EIS are those determined during the forest planning process for the alternative (7R) that was chosen for implementation (CNF RFP EIS). However, it is important to note that these numbers do not bind the CNF to any certain level of grazing. One way that suitability designations can change is during the site-specific allotment planning process and regardless of suitability numbers, actual livestock use of vegetation is based upon proper implementation and monitoring of forage utilization standards.

As part of its planning process, the CNF determines capability, suitability, and rangeland condition and then administers livestock permits on various allotments through site-specific Allotment Management Plans (AMPs). AMPs include livestock rotation schedules, utilization requirements, planned structural and non-structural improvements, maintenance standards, and tentative grazing capacities. Site-specific standards are also included in the Annual Operating Instructions (AOI) that are issued annually to livestock permittees. Typical AOIs include approximate numbers and rotation dates for grazing throughout the season. The RFP prescribes allowable utilization levels that represent the maximum vegetation use in general locations such as riparian or upland areas; allotment-specific use levels can be stipulated to be lower, if necessary, using adaptive management.

Generally, livestock may be trailed or trucked through the CNF, depending upon the AMP and AOI stipulations. Trailing corridors in the Study Area include a route along Rock Creek to Manning Creek to access the Manning Creek and Deer Creek Allotments from the south and a route along Diamond Creek to Sage Creek to access the Sage Creek Allotment from the north.

Figure 3.9-1 Grazing Allotments in the CEA

TABLE 3.9-1 RANGE ALLOTMENT INFORMATION FOR THE STUDY AREA

ALLOTMENT	SUITABLE ACRES		RANGE IMPROVEMENTS	STOCKING RATE (ANIMAL MONTHS)	
	FOR CATTLE	FOR SHEEP		CATTLE (COW/CALF MONTHS)	SHEEP (SHEEP MONTHS)
Sage Valley	1,228	1,521	Stock ponds (3I8RA9)(3I8RB9) (3I8RC9)(3I8RD9)	507	3,964
Sage Creek	1,223	2,348	None	431	4,284
Green Mtn.	2,979	4,163	None	944	7,715
Manning Creek (currently being temporarily managed as one unit with Deer Creek)	2,658	4,091	Headbox & troughs (344SC9) (344SA9) Stock ponds (344RB9 & 318RP9) Water pipeline (344NA9) (344TA9) Reservoir (344RA9)	706	7,650
Deer Creek	1,448	2,496	Nate Canyon Stock Pond (335RA9)	329	5,106
Wells Canyon	1,631	2,281	Headbox and troughs (337A9)	661	3,160
Lower Crow	68	79	None	38	214

For the Study Area allotments, grazing is allowed for varying specific dates between June 1 and September 30. Most of the allotments allow about two month's consecutive time; the Sage Valley Allotment can be grazed over the entire 4-month timeframe. However, if CNF personnel determine a shortage of forage production or other unacceptable impacts, early removal of livestock from an allotment or pasture may be required. Livestock grazing on USFS lands relies upon nearby stream and spring water sources, with water rights held by the CNF; some of these sources are developed with head boxes and troughs. Sheep typically are moved to new areas every day for feed, which helps to maintain water quality and rangeland condition.

In addition to the structural range improvements on CNF allotments listed in **Table 3.9-1**, other range improvement projects on area allotments include continued treatment of noxious weeds such as musk thistle, Dyer's woad, and Canada thistle. As established by prescriptions in the recently completed RFP (USFS 2003a), additional improvements, revisions to AOIs and AMPs, riparian zone restrictions, utilization guidelines, and other changes may be made for various allotments in the future to ensure that forage can continue to be provided while maintaining diverse and healthy rangelands.

Although the USFS lands in the Study Area comprise most of the lands that are grazed, state-owned and privately owned lands are also subject to livestock uses. Grazing on private land is based upon a given landowner's preferences and detailed records (of amount, type of use, etc.) are not necessarily available to the public. There is one section of land in the Study Area (Section 36 in T9S, R45E) that is owned by the State of Idaho, and grazing in that area is regulated by the Idaho Department of Lands. According to their records (Jeff Nauman, personal communication, 2004), there are two leases currently operating in that section. One is comprised of 560 acres and 45 billable Animal Unit Months (AUMs), with grazing allowed between July 1 and September 20. The other is in the E½ of the SE¼ of the section, covering the remaining 80 acres with 32 AUMs. Its period of use is from June 1 to September 30. The former, larger parcel has no perennial water sources, while the latter has a riparian area that is reportedly spring-fed. In the last cycle of lease renewal, a range assessment indicated that vegetation conditions were good in both of these State lease areas.

3.10 Recreation and Land Use

3.10.1 Recreation

The majority of the Study Area is within the Montpelier Ranger District of the CNF. The Study Area also includes Idaho state land, private lands, and Wyoming county and/or private lands. Recreation information and use data is available predominately for CNF lands. Many recreation opportunities are offered on the CNF, such as camping, hiking, fishing, hunting, snowmobiling, horseback riding, and mountain biking. Within the Study Area, all of these are available, although there are no developed campgrounds. Recreation and travel access are closely related topics; access is discussed below under Land Use (**Section 3.10.2**).

Recreation visits to the CNF have increased an average of 4 percent annually since 1980 (USFS 2003b). CNF use figures are based on personal observation by CNF staff and fee receipts from campgrounds and recreation special uses. Percentages of various recreation uses on the CNF include camping/picnicking (43 percent), motorized activity (25 percent), hunting/fishing (17 percent), and other (15 percent) (USFS 2003b). The CNF conducted recreation use surveys from October 2004 to October 2005 to update and broaden the base of use data for the CNF and for future planning efforts.

The State of Idaho has prepared a 2003-2007 Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP). This plan was developed with input from all types of recreation management agencies and groups in Idaho.

Recreation sites and activities are divided into two broad categories – Developed and Dispersed. Developed recreation sites are areas of concentrated development, such as a campground or trailhead with improvements. Dispersed recreation requires few, if any improvements and occurs typically in conjunction with roads or trails. Dispersed activities are often day-use oriented and involve many types of activities, including fishing, hunting, berry picking, off-road vehicle use, hiking, horseback riding, picnicking, camping, viewing and photographing scenery, and snowmobiling. Most recreation in the Study Area is dispersed.

In order to inventory and manage recreation areas and activities, the CNF uses a planning tool called the Recreation Opportunity Spectrum (ROS), which categorizes recreation settings by the amount of development and other attributes. ROS categories include: Primitive, Semi-Primitive Non-motorized, Semi-Primitive Motorized, Roaded Modified, Roaded Natural, and Urban. Recreation use is allocated using the ROS classes, which help visitors find the setting that best provides for their desired experience.

There are two ROS categories in the Study Area listed below. Their class setting descriptions include the following factors:

Semi-primitive Motorized (SPM) - The setting for SPM lands includes a moderate probability of: solitude, closeness to nature, a high degree of challenge and risk using motorized equipment, predominantly natural-appearing environment, few users but evidence shows on trails, and few vegetation alterations that are widely dispersed and visually subordinate. Semi-primitive Motorized areas range from 2,500 to 5,000 acres that are screened by vegetation or topography, creating a "buffer" from surrounding development. The majority of lands in the Study Area are designated as SPM, comprising a block of approximately 14,890 acres.

Roaded Modified (RM) – The setting for RM lands includes the opportunity to be with others in developed sites, little challenge or risk, relatively natural appearing environment as viewed from roads and trails, moderate evidence of human activity; access and travel by standardized motor vehicles, and resource modification and utilization is evident but generally harmonizes with the natural environment. The RM corridors in the Study Area (for Diamond Creek Road, Wells Canyon Road, Timber Creek Road, and Crow Creek Road) generally surround the SPM block noted above.

The ROS categories are shown on **Figure 3.10-1**. The RFP Guidelines suggest project planning that meets the ROS per the CNF ROS map.

Developed Recreation

Campgrounds & Guard Stations

There are no developed campgrounds within the Study Area. Diamond Creek Campground, approximately 7 miles north, and Summit View Campground, approximately 5 miles west, are the closest designated campgrounds to the Study Area. Diamond Creek Campground is a rustic campground, consisting of 12 sites, without tables or grates. It experiences moderate use during summer months for general recreation and relatively heavy use during the fall big game hunting season. There are no fees charged for use of the Diamond Creek Campground. The site has been fenced to exclude livestock use of the area.

The Diamond Creek Warming Hut is adjacent to the campground and consists of two A-frame structures moved from the Johnson Guard Station to the current location in 2000. The hut was constructed as a joint effort of the Caribou Trail Riders, the CNF, and the Idaho Department of Parks and Recreation. The hut provides a gathering place and shelter for summer and winter recreationists using ATVs (all-terrain vehicles) and snowmobiles. The Caribou Trail Riders maintain the site under an agreement with the CNF, Soda Springs Ranger District (Moe 2003).

Summit View Campground is at an elevation of 7,200 feet, and is open from June 1 to September 30. It includes 23 units and 3 group sites. Use fees are required.

The Johnson Guard Station is located approximately one mile north of the Diamond Creek Campground and is available for rent year round. Clear Creek Guard Station is located on Crow Creek Road (FR 111) about three miles south of the junction with Wells Canyon Road (FR 146) and is also available for rent.

Dispersed Recreation

The dominant type of dispersed recreation in the vicinity of the Smoky Canyon Mine is big game hunting for elk, moose, and deer. Hunters place a high demand on the developed and dispersed campsites, and on CNF roads and trails. ATVs provide many advantages to hunters but also create some hunter conflicts. Elk use typically declines in areas open to motorized vehicles (USFS et al. 2001).

Fishing is also popular on Crow, Deer, and Diamond Creeks. Other dispersed recreation activities occurring in the area include snowmobiling, cross-country skiing, horseback riding, upland bird hunting, camping, picnicking, driving for pleasure/sight-seeing, and off-road vehicle use. Popular dispersed use areas include Manning Creek, South Fork Sage Creek, Deer Creek, North Fork Deer Creek, Upper Diamond Fork, and Sage Meadows.

Big Game Hunting

Game Management Unit (Hunt Area) 76 (Diamond Creek) encompasses the Study Area.

Archery season for deer and elk extends from August 30 to September 30. General (any weapon) season for mule deer generally occurs for a two-week period in early October. There are no controlled hunts for mule deer in Hunt Area 76 (IDFG 2003).

Elk populations are stable or increasing in Idaho. Security areas are blocks of habitat that provide hiding cover for elk and increase the chances that elk will survive the hunting season, increasing hunter opportunity overall. The greatest concentrations of elk are in areas least accessible to motorized vehicles.

Controlled hunts for antlerless elk occur from mid-November thru December. Controlled hunts for antlered moose occur from August 30 through the third week of November and for antlerless moose from October 15 through the third week of November. There are no special permits or hunts for bighorn sheep or mountain goats in Hunt Area 76. For 2004, in Hunt Area 66A, which includes southeastern Idaho from the Utah/Idaho line to McCoy Creek, there were 641 antlered elk permits, 1,300 antlerless elk permits, and 9 antlered only-outfitter allocated permits.

Mule deer season for antlered deer is October 5-19. Due to high demand in areas 75, 76, 77, and 78 (includes portions of Franklin, Bear Lake and Caribou counties, Idaho), a limited entry drawing is offered for non-residents, who must then purchase a special Southeast Idaho Deer tag.

Hunting for black bear and mountain lion also occurs within the Study Area. Black bear hunting is allowed from August 30 through October and during a spring season from April 15 to June 15. Mountain lion season extends from August 30 through March 31 (IDFG 2003). Mountain lion harvest in Hunt Area 76 has ranged from one to nine with an average of about three per year from 1991 to 2002 (IDFG 2004).

Other Hunting

Hunting of grouse (blue, ruffed) on the CNF occurs from September 1 through December. Sage grouse occur in lower Crow Creek and can be hunted from mid-September through mid-October. Other upland birds such as pheasant, quail, and partridge do not typically occur in the Study Area (IDFG 2003).

Figure 3.10-1 USFS Road Designations and Recreational Points

Hunting of badger, fox, and raccoon is open year round. Hunting for bobcat is allowed from mid-December to mid-February (IDFG 2003).

Off-Highway Vehicle (OHV) and/or All-Terrain Vehicle (ATV) Use

ATVs have grown in popularity during the past decade, increasing the demand on the CNF to accommodate this type of recreation. In Idaho, 95 percent of ATV and motorbike riding opportunities occurs on USFS or other public land (Maxim 2004g). During the period from 2000 to 2004, Idaho experienced an 87.6 percent increase in registration of ATVs and motorbikes (IDPR 2005). In Caribou County, Idaho, ATV and motorbike registration increased 53 percent in the same time frame. Information on 2004 registrations shows there are over 11,483 OHVs registered in Southeastern Idaho (IDPR 2005).

Under a USFS policy (New OHV Rule was issued November 2005) for OHV use on National Forest System lands and Grasslands, each forest is required to designate a system of roads, trails, and areas where OHV use would be allowed. OHVs include motor vehicles that are designed or retro-fitted primarily for recreational use off road, such as minibikes, amphibious vehicles, snowmobiles, motorcycles, go-carts, motorized trail bikes, and dune buggies.

The CNF initiated a Travel Plan Revision in March 2003 to address summer and winter travel, and tier to the RFP (USFS 2003a), which provides limits on open motorized route densities. The CNF Revised Travel Plan EIS and ROD were signed in November 2005.

Hiking

Most hiking in the area occurs during the fall months and is likely associated with big game hunting. There are several trailheads in the Study Area; #33 Sage Meadows, #34 Camel Hollow, and #35 Trappers Cabin are shown on CNF maps, although the 'trailheads' are undeveloped and similar to other points where trails intersect roads. Parking provided at trailheads varies from three to five spaces. No other facilities are provided. Trails partially or completely within the Study Area are shown on **Figure 3.10-1.** Location and approximate length of trails that occur in the Study Area are described in **Table 3.10-1.** Trail lengths and restrictions may change pending revisions to the Travel Management Plan.

A designated CNF Point of Interest near the Study Area is the Snowdrift Mountain Trail (No. 113). This high ridge often holds snow yearlong. Huge snowfields pile up on the leeward side and often slide as avalanches to canyons below (USFS 2002b). The Snowdrift Mountain Point of Interest is shown on **Figure 3.10-1.**

TABLE 3.10-1 TRAILS WITHIN THE STUDY AREA

TRAIL NO.*	NAME	APPROXIMATE LENGTH	LOCATION DESCRIPTION
092	S. Fork Sage Cr.	4 miles	Extends from FR 145 to FR 144 through S. Fork Sage Creek.
093	Deer Cr.	5 miles	Extends from Diamond Creek Road (FR 1102) to Crow Creek Road (FR 111). Portion of trail near Crow Cr. crosses private land.
095	Camel Hollow	2 miles	Extends from Crow Creek Road (FR 111) connecting to Pine Creek Trail No. 096.
102	N. Fork Deer Cr.	2.5 miles	Extends from FR 145 to Deer Creek Trail No. 093.
401	Panther Springs	2 miles	Connects between S. Fork Sage Creek Trail No. 092 and Manning Creek Trail No. 402.

TRAIL NO.*	NAME	APPROXIMATE LENGTH	LOCATION DESCRIPTION
402	Manning Basin	3 miles	Extends from FR 740 connecting with S. Fork Sage Creek Trail No. 092.
403	Pinnacle Peak	1.5 miles	Extends from Diamond Creek Road (FR 1102) connecting with N. Fork Deer Creek Trail No. 102.
404	Well Park	1 mile	Extends from FR 146 connecting with Deer Creek Trail No. 093.
405	Sage Valley	3 miles	Extends from end of FR 586 to FR 179.
406	Sage Meadows	1 mile	Extends from Diamond Creek Road (FR 1102) to FR 145.

Source: USFS 2002b.
*These trails are all non-motorized.

Winter Season Recreation Use

Snowmobile registration in Idaho increased 110 percent (from 22,300 to 46,800) between 1989 and 2001(USFS 2003b), and 10 percent from 2001 to 2004 (IDPR 2005). In 2004 there were 760 snowmobiles registered in Caribou County, Idaho (IDPR 2005). Most of the Study Area currently is open to cross-country snowmobile use. However, the Travel Map (USFS 2002b) restricts snowmobile use to designated routes in some areas of big game winter range. Although big game winter range occurs between Deer Creek and Manning Creek, the area is not restricted. The Bear Lake State Park program and Caribou Trail Riders club help provide groomed trails, signing, and warming shelters. The Diamond Creek Warming Hut is operated and maintained by the Caribou Trail Riders club. Diamond Creek Road (FR 1102), Crow Creek Road (FR 111), Wells Canyon Road (FR 146), and Freeman Pass areas are popular snowmobile routes. Currently in the winter months along Crow Creek Road, snow plowing stops approximately three miles southwest of the Idaho/Wyoming border. Trucks and trailers can park here and unload snowmobiles.

Cross-country Skiing

Cross-country skiing in the Study Area is limited. The area is distant from population centers where other more attractive and nearby cross-country skiing experiences are available.

Mountain Biking

All roads in the Study Area are open to mountain biking.

3.10.2 Land Use

The types of lands within the Study Area provide for a variety of uses. CNF lands are used for recreation, CNF products such as timber sales and firewood, livestock grazing (see **Section 3.9**), wildlife habitat (see **Section 3.7**), and minerals extraction. Private lands in the Study Area are used for seasonal homes, ranching, and recreation. Rights-of-way provide access and utilities. All of these uses, in addition to ongoing or event-type, natural, and human-induced disturbances influence the land or ecosystem condition. The desired condition of CNF ecosystems is one of sufficient complexity, diversity, and productivity to be resilient to disturbances (USFS 2003a).

The CNF lies on the western edge of an area defined as the Greater Yellowstone Ecosystem (GYE). At over 12 million acres overall, the GYE is the largest block of relatively undisturbed plant and animal habitat in the contiguous U.S. The United Nation (U.N.) has defined the area as a Biosphere Reserve (CTNF 2004). The Study Area covers approximately 20,414 acres, less than 0.2 percent of the area of the GYE. Wildlife habitat and plant habitats in the Study Area are discussed in **Sections 3.7** and **3.5**, respectively. Inventoried Roadless Areas, Research Natural Areas, and Wilderness areas are discussed in **Section 3.11**.

Land Status/Ownership

Lands in the Study Area are a compilation of CNF, State of Idaho, and private ownership (**Figure 3.10-2**). CNF lands make up the majority of the Study Area. The State of Idaho has one section within the Study Area.

The larger private parcels are predominantly ranching properties along Crow Creek Road; however, smaller parcels (from under 1 acre to 6 acres) are also held privately. According to Caribou County records, the landowners along the Crow Creek Road are listed as follows and shown on **Figure 3.10-2**: Peter Reide, Fred K. Nate, Larry Alleman et al., Karolyn Alleman, Nevada Rock & Sand Company, Tolman Family Association, Dickson Whitney and Osprey Partners, Dan C. Peart, Ruth L. Rasmussen, Bruce W. Jensen, and Karen Oakden.

CNF Management

The Caribou and Targhee National Forests were officially combined in 2000. The RFP for the Caribou portion was approved early in 2003. Goals identified in the RFP for the CNF (USFS 2003a) include development of phosphate resources using practices for surface resource protection and reclamation, and with consideration to social and economic resources. Based on this premise, proposed development of Smoky Canyon Mine Panels F and G would be consistent with the RFP for the CNF, Travel Plan for the CNF, and the current management regulations concerning roadless areas (as described previously in **Section 1.3.2**).

In addition to the goals for development of phosphate resources, the RFP also has management prescriptions (MPs) that are designed to meet the DFCs of the CNF.

Management Prescriptions

Management prescriptions are a set of practices applied to a specific area to attain multiple-use and provide a basis for consistently displaying management direction on land administered by the CNF. Prescriptions identify the emphasis or focus of management activities for an area, but do not necessarily construe exclusive use. Management prescriptions do not stand alone, but are part of the management direction package for the CNF that also includes Forest-wide goals, objectives, standards (S), and guidelines (G). Where a management prescription allows an activity, such as recreation or livestock grazing, the standards and guidelines in the prescription or in the CNF-wide direction provide specific parameters within which the activity must be managed. In areas where prescriptions are applied, direction in this section would overrule CNF-wide direction only if the prescription conflicts with the CNF-wide S&Gs (USFS 2003a). Although the management prescription that applies to the majority of the Proposed Action is 8.2.2, all components of the Proposed Action that occur outside the ½-mile buffer area (i.e., haul access roads) need to follow the appropriate management prescription that would be in effect. Management prescriptions in the Study Area are shown on **Figure 3.10-3** and include:

<u>Prescription 2.7.2 – Elk and Deer Winter Range</u>

This management prescription emphasizes management actions and resource conditions that provide quality elk and deer winter range habitat. Access is managed or restricted to provide security for wintering elk and deer. Motorized travel is restricted to designated roads and trails. This prescription applies to an area including the southern half of Panel F.

Prescription 5.2 – CNF Vegetation Management
Emphasis of this prescription is on scheduled wood-fiber production, timber growth, and yield, while maintaining or restoring forested ecosystem processes and functions to more closely resemble historical ranges of variability with consideration for long-term CNF resilience. Motorized use is prevalent for timber management activities and recreation. This prescription applies to an area including the northern half of Panel F.

Prescription 6.2 – Rangeland Vegetation Management
This prescription focuses on maintaining and restoring rangeland ecosystem processes and functions to achieve sustainable resource conditions. Activities in these areas are designed to achieve restoration of non-forested vegetation to the historic range of variability and include watershed restoration, thinning, prescribed fire, wildfire for resource benefit, and noxious weed treatments. Dispersed recreation activities occur throughout these areas. Motorized transportation is common, but some seasonal restrictions may occur. This prescription applies to an area including Panel G.

Prescription 2.8.3 – Aquatic Influence Zone (AIZ)
As stated in various previous sections, this prescription applies to the habitats associated with aquatic areas (wetlands, streams, springs, bogs, lakes, ponds, etc.), in order to protect, restore, and maintain health of these areas. AIZ attributes must be maintained in areas developed for minerals. Standards require minimum instream flows to be maintained at road crossings or other instream facilities, and fish passage provided where needed**.** **Figure 3.3-2** displays the AIZs within the Study Area.

Prescription 8.2.1 – Inactive Phosphate Leases
This prescription applies to existing federal phosphate leases that have not been or are not scheduled for development and KPLAs. A KPLA is land known to contain phosphate deposits that have been formally classified by the U.S. Geological Survey as subject to leasing. A ½-mile buffer of land around each KPLA is also included in this management prescription. Exploration and road construction may be allowed in these areas, subject to NEPA analysis.

Prescription 8.2.2 – Phosphate Mine Areas
These areas are federal phosphate lease areas where mining, post-mining reclamation, or exploration is taking place. This prescription realizes the dynamic process involving research and technology that affects the BMPs that are implemented for mining operations. Phosphate deposits on federal land are managed under the 1920 Mineral Leasing Act, as amended, and Federal Regulations at 43 CFR, Part 3500. BLM is the designated federal agency with authority to issue or modify federal phosphate leases and/or approve exploration and development activities. Where Forest land is involved, BLM consults with USFS regarding lease issuance and development proposals, but the final authority rests solely with BLM. The USFS issues decisions with formal BLM recommendations for off-lease activities.

In addition to Prescription 8.2.2, which applies to Phosphate Mine Areas and provides goals and objectives for development of existing leases, a direction is provided in the RFP under Reclamation of Mined/Drastically Disturbed Lands. This management prescription applies to the majority of the Project Area, with the exception of any areas that occur outside the ½-mile buffer area. In those cases, the appropriate management prescription described above applies.

Figure 3.10-2 Private Owners

Figure 3.10-3 Management Prescriptions – Suitable Timber

Special Use Authorizations

The RFP (USFS 2003a) allows special uses that are compatible with other resources. Special Use Authorizations (SUAs) are issued for uses that serve the public, promote public health and safety, protect the environment, and are legally mandated. Bonds or other security instruments are required if the CNF determines that a use has potential for disturbance that may require rehabilitation or when needed to ensure other performance. The CNF establishes and maintains rental and user fees for all SUAs. Current SUAs located in the Study Area are described in **Table 3.10-2** and their general locations are shown on **Figure 3.10-4**.

The CNF can issue SUAs for those portions of exploration and mining operations that lie on CNF land outside mineral lease boundaries. Off-lease mine related SUA facilities could include portions of haul roads, mill sites, power lines, communication sites, temporary stockpiles (topsoil/ore/waste rock), or drainage control structures. However, permanent disposal of mine overburden solid waste is not permitted under SUAs [36 CFR 251.54].

TABLE 3.10-2 SPECIAL USE AUTHORIZATIONS

SPECIAL USE AUTHORIZATIONS				
PERMITEE	**AUTHORIZATION NO.**	**DATE ISSUED**	**EXPIRATION DATE**	**DESCRIPTION**
U.S. Fish & Wildlife Service	CAR0004-01	Nov. 1954	Dec. 2017	Covers 10 acres in NW¼, Sec. 5, T. 10 S., R. 45 E. on South Fork of Deer Creek for the purpose of constructing and maintaining a cabin for use by trappers engaged in predator control and game management on the CNF.
Stewart Brothers	CMT31	July 2003	Dec. 2022	Issued for irrigation pipe and related intake system in Sec. 15 & 16, T. 10 S., R. 45 E.
Tolman Family Association	CAR5429-01	Nov. 1997	Dec. 2017	Issued on 0.15 acres in NW¼ NE¼, Sec. 31, T. 9 S., R. 46 E. for headbox, water collection system and pipeline.
Bridger-Teton National CNF	CAR0008-01	July 1975	Dec. 2015	Issued for 0.5 acres in Sec. 12, T. 9 S., R. 45 E. to establish an electronic site on Sage Peak consisting of small buildings and related antenna facilities.
Lower Valley P&L Co,	CAR4033-02	Nov. 1982	Dec. 2012	Issued for powerline right-of-way 40-feet in width and 1.42 miles in length in Sec. 31 & 6, T. 10 S., R 46 E.; and Sec. 2, T. 10 S., R. 45 E.
J.R. Simplot Co.	CAR4067-02	Sept. 1992	Dec. 2021	Issued for 1,070 acres for the purpose of mill site, stockpile overburden fills, service roads, warehouse facilities, offices, parking area, maintenance shops, processing plant, and related facilities associated with processing phosphate rock from Federal Phosphate Lease I-012980.
	SSC17	April 2002	Dec. 2007	Issued to allow Simplot and subcontractors access to Deer and Manning Creek lease areas to begin baseline data collection activities.

Other Utilities and ROWs in the Study Area

In addition to SUA areas, which are located on CNF lands, other rights-of-way occur within the Study Area. The portion of Crow Creek Road north of Wells Canyon and within the CNF is in an easement granted to Caribou County by the CNF for operation and maintenance of the road; it extends 33 feet each side of the road center line. Other sections of Crow Creek Road outside the CNF are under county jurisdictions – Caribou County in Idaho and Lincoln County in Wyoming.

The Wells Canyon Road east of the CNF boundary is under a ROW easement granted by the property owner to the CNF. It extends 12.5 feet each side of centerline for a total width of 25 feet.

Timber Management

The timber harvest in Idaho has declined by 31 percent since 1990 (USFS 2003b), along with national trends of reduced demand for timber. The decline in USFS timber harvest during this time has been even more dramatic, a 78 percent decrease. Each year, the CNF offers timber for sale, and these sales are completed based upon supply/demand. An operator has a specified period to harvest timber once a sale is completed. The CNF provides a variety of wood products to the public, including saw timber, house logs, chips, firewood, Christmas trees, posts, and poles.

The Montpelier District had no timber sale offerings in 2003. The Twin Creek Timber Sale, located in Georgetown Canyon in the watershed to the west of the Study Area, was offered and sold in 2006 but will not be logged for two to three years. No timber sales are planned in the Crow Creek watershed in the 5-year timber sale plan.

Tentatively suitable timberlands have been reassessed as part of the RFP for the CNF (USFS 2003a). Tentatively suitable acres are those forest land areas available and capable of sustainable timber production. These lands represent the maximum acres that could be managed for regular predictable timber outputs and are used in determining the Allowable Sale Quantity (ASQ) (USFS 2003b). ASQ is the amount of timber that may be sold from the area of suitable land covered by the CNF Plan for a time period specified by the Plan. This quantity is normally expressed as the "average annual allowable sale quantity" (USFS 2003b). Other forested areas can be cut under the Plan for different management reasons, regardless of whether or not the ASQ is met for a specific year.

Under the RFP (USFS 2003a), Management Prescription 5.2 – CNF Vegetation Management is the only prescription where suitable timber is included in the ASQ. Timbered land in all other prescriptions within the Study Area has been removed from the suitable timber base and does not contribute to the ASQ on the CNF.

The Panel F and Panel G lease areas encompass a total of approximately 2,000 acres (including lease modification areas of Panel F). The lease areas contain approximately 1,600 acres of tentatively suitable timber. However, only the portion of Panel F that lies within Prescription 5.2 is included in the ASQ. This portion of Panel F contains 641 acres of tentatively suitable timber (108 acres aspen, 170 acres aspen/conifer, and 363 acres conifer).

Overall, Panel F contains 1,057 acres of tentatively suitable timber (359 acres aspen; 210 acres aspen/conifer; 488 acres conifer); Panel G contains 553 acres of tentatively suitable timber (276 acres aspen; 1 acre aspen/conifer; 276 acres conifer).

3.10.3 Access Roads and Trails

Public access to the Panels F and G Project Area is via County Road 236 from Afton and Fairview, Wyoming, and southwest on Crow Creek Road for several miles into the CNF. From Montpelier, Idaho, access is via Highway 89, up Montpelier Canyon and north on Crow Creek Road. Access from Georgetown, Idaho is up Georgetown Canyon to FR 1102.

Figure 3.10-4 Land Status and Special Use Permits

Primary access routes to the Study Area include the Crow Creek, Georgetown, Wells Canyon, and Diamond Creek roads. Crow Creek Road (FR 111) extends approximately 50 miles northeast from U.S. Highway 89 near Montpelier to near Afton, Wyoming. Georgetown Canyon Road (FR 102) extends northeast from its intersection with Highway 30 at Georgetown, Idaho to its intersection with the Wells Canyon Road. Diamond Creek Road (FR 1102) extends south from its intersection with the Blackfoot River Road in Upper Blackfoot River Valley approximately 25 miles to the intersection with the Wells Canyon Road (FR 146). Wells Canyon Road (FR 146) extends northwest from its intersection with the Crow Creek Road approximately 4.2 miles to its intersection with the Georgetown Canyon and Diamond Creek Roads. Access to the area is also possible using the Smoky Canyon/Timber Creek Road (FR 110). Active mine areas are closed to public motorized travel for safety reasons.

Traffic on CNF roads in this area is light to moderate. Shift changes at Smoky Canyon Mine reflect periodic traffic increases along Smoky Canyon Road (FR 110) between the mine and the Star Valley area. Moderate traffic on Crow Creek Road (FR 111) is mostly local access with some through traffic (seasonal) to Montpelier Reservoir and the town of Montpelier. Diamond Creek Road (FR 1102), Georgetown Canyon Road (FR 102), and Wells Canyon Road (FR146) traffic varies from light to moderate on weekdays and weekends, respectively. Traffic increases noticeably on all CNF roads in the area during the fall hunting season (Duehren 2003).

An objective identified in the RFP is to revise the CNF travel plan to incorporate RFP direction for access management. RFP Standards and Guidelines that are applicable to travel planning include:

- Open Motorized Route Densities (OMRDs) shall not exceed the limits identified in the Plan OMRD Map or the Plan Amendments #1-3 to the 2003 RMP. OMRD is defined as the miles of designated motorized roads and trails per square mile within a specific prescription polygon.
- The OMRD standard and restrictions depicted on the travel plan map do not restrict responses to emergency events to protect human life, property values, structures, and CNF resources.
- The travel planning process shall consider additional areas for non-motorized winter recreation.
- Any motorized vehicle access on a restricted road or trail or in a restricted area shall be for official administrative business only and shall be officially approved.
- Unless otherwise posted, motorized access is allowed for parking, wood gathering, and dispersed camping within 300 feet of an open designated road.
- The construction of new or maintenance of existing motorized and non-motorized access routes should be consistent with the ROS class in which they are located.

Mine access roads, as well as other special use roads, that are not open to the public are not included in the OMRD calculations.

Travel plans are legally enforced through the issue of a Special Order signed by the CNF Supervisor. In 2003, a Special Order was added to the 2002 CNF travel plan map prohibiting cross-country motorized access during the snow-free season on most areas of the CNF. In areas that were formerly open to cross-country, motorized use, all roads and trails depicted on the 2002 map became the designated routes, until the revised travel plan analysis and decision were completed. This was done to comply with RFP direction.

The 2003 RFP closed 96 percent of the CNF to cross-country motorized travel (USFS 2003a). Only a small area on the Soda Springs Ranger District remains open for this type of use. In addition, the RFP set a ceiling for motorized route densities for each management prescription area OMRDs. The Revised Caribou Travel Plan (USFS 2005f) includes a reduction in designated motorized roads and trails forest-wide; additional designated mountain bike trails; and identifies non-motorized system trails that will be maintained over time. This meets the desired future condition for the transportation system described in the 2003 RFP. In addition, the Travel Plan complies with the National Travel Management Rule, released November 2, 2005.

According to the Revised Travel Plan, the following summer travel routes within the Study Area would remain open to motorized vehicles over 50 inches in width:

20111 – Crow Creek Road
20740 – Manning Creek Road
20586 – Sage Valley Road
20146 – Wells Canyon Road
20220 – Snowdrift Road
20690 – Middle Deer Creek Road
21102 – Diamond Creek Road
20102 – Georgetown Canyon Road
20145 – Sage Meadows Road
20179 – South Fork of Sage Creek Road

Winter travel routes include snowmobile routes up Manning Canyon and Wells Canyon. Within elk and deer winter range, which includes the entire northern end of the Study Area, snowmobile use would be limited to designated routes only. Non–motorized travel is generally allowed on all routes.

RS 2477 (Revised Statute 2477) is legislation that allows counties to assert that they have access rights on roads and/or trails that existed prior to the establishment of the CNF. The RFP provides for resolution to RS 2477 issues. There are no known RS 2477 assertions within the Study Area. However, the Crow Creek Road was established prior to the reservation of the forest and would probably qualify as a RS 2477 route.

Under the Revised Travel Plan, the construction of new roads or maintenance of existing routes should be consistent with the ROS classes in which they are located.

3.11 Inventoried Roadless Areas/Recommended Wilderness and Research Natural Areas

3.11.1 Inventoried Roadless Areas/Recommended Wilderness

As displayed on **Figure 3.11-1**, portions of the Proposed Action and Action Alternatives lie within portions of two Inventoried Roadless Areas (IRAs): the Sage Creek Roadless Area (SCRA) and the Meade Peak Roadless Area (MPRA). The SCRA encompasses approximately 12,710 acres, 3,021 of which are under existing active phosphate leases. The majority of Panel F, including proposed lease modifications, the majority of Panel G, and the majority of the haul/access roads to Panel G lie within the SCRA. An additional 2,287 acres are within

Figure 3.11-1 Inventoried Roadless Areas of Sage Creek, Meade Peak and Gannett Spring

unleased KPLAs that represent 18 percent of the SCRA. The MPRA encompasses approximately 44,585 acres of which approximately 1,140 acres are leased for phosphate mining with an additional 2,580 acres having been identified as KPLAs (USFS 2003b). A small portion of the extreme southwestern area of Panel G and a short segment of the Proposed Action Panel G haul/access road occurs within the MPRA. National Forests are required to re-evaluate and re-inventory roadless areas for possible inclusion in the National Wilderness Preservation System as part of Forest Plan revisions. Under the RFP (USFS 2003a), no Recommended Wilderness areas occur within the Study Area. The IRA characteristics (i.e., roadless and wilderness attributes) for each of the IRAs in the Study Area are summarized below. The summarized information applies to the entire IRA being described, not just the portion of the IRA within the Study Area. Currently, according to the roadless rule, lessees are permitted to access leases and produce minerals within the IRAs.

Sage Creek Roadless Area

Roadless Attributes

The SCRA is described by the Roadless Area Conservation Initiative (RACI) resource attributes listed below, which have been summarized from USFS (2003b).

Soil: Soils are mainly stable in the SCRA; only 2 percent of the soils are rated unstable. Approximately 23 percent of the area has an erosion hazard.

Air: The SCRA is within the 20-mile sensitive receptor radius and is within 200 kilometers of a Class I area. Nearby towns that are classified as sensitive air quality receptors are Afton, Wyoming, and Soda Springs, Idaho.

Water/Sources of Public Drinking Water: Overall the watersheds are rated in moderate condition. Three tributaries of Crow Creek, South Sage, Manning, and Deer creeks, drain the area. In contrast to neighboring watersheds to the north and west, the Deer Creek watershed has been relatively unimpacted by mining and related activities.

Diversity of Plant and Animal Communities

Vegetation: Vegetation communities are composed of forest and grass/shrub communities. Forests comprise approximately 78 percent of the vegetation; grass/shrub communities account for approximately 22 percent of the vegetation. Conifers cover over 40 percent of the area. Forested communities are composed of Douglas-fir, aspen, mixed conifer, lodgepole pine, and aspen/conifer. Aspen decline is rated high because of aging and conifer encroachment of aspen stands. The ratings for both insect and fire hazard in forested communities are moderate because of the older conifer composition and fuel buildup in the understory. Grass/shrub communities occur only in small patches in the area. Invasive species (Canada thistle and musk thistle) comprise less than one percent (0.2) of the area (22 aces). The South Fork Sage Creek, Pole Canyon, and Sage Creek Timber Sales, and historic and active exploration and mining activities are past/current disturbances to vegetation in the area.

Wildlife and Fish: The Noss ranking analysis was not completed for this area (Noss et al. 2001), but the area was ranked low for wildlife biological strongholds during the resource management plan analysis. In addition, the departure from Proper Functioning Condition (PFC) is moderate (USFS 2003b). The grass/shrub habitats are rated low for sage grouse because of the patchy grass/shrub habitat and the distance to the nearest sage leks (5 miles). Fisheries biological strongholds are rated high because of the presence of YCT, a Forest sensitive species, expected in Sage and Deer creeks (USFS 2003b). Forest personnel also believe YCT occur in the North Fork of Deer Creek. Fisheries surveys in 2003 have confirmed that YCT are present in Deer Creek and the North Fork of Deer Creek.

Threatened, Endangered, Sensitive, and Rare Species Occurrence/Habitat: Threatened and endangered species known to occur in the area include the gray wolf. The area is rated high for lynx linkage habitat because of the following factors: 1) the presence of a major north-south ridge, which could provide a movement corridor; 2) the area has 41 percent conifer; 3) location midway between the Targhee and south end of the Preuss Range; and 4) the area offers about 9 percent for security areas. The area is ranked low for the gray wolf because of the low amount of security.

USFS sensitive species that have documented occurrences include three-toed woodpecker, Northern goshawk, and great gray owls. The area is rated high for forest-associated sensitive species. No rare plants, rare plant communities, or plant community reference areas have been documented in the area.

Reference Landscapes: The Deer Creek watershed has not been impacted by mining and could be used as a unique aquatic reference (i.e., control comparison watershed at landscape level).

Scenic Integrity: Scenic integrity is low including partial retention areas with moderate scenic integrity (4,043 acres), and modification areas with low scenic integrity (8,688 acres).

Recreation (Primitive, Semi-Primitive non-motorized, and Semi-Primitive Motorized): Recreation use has increased in the area. The area is managed for both summer and winter recreation. In summer, part of the area (10,764 acres) is managed for semi-primitive motorized recreation experience while the remaining land (2,037 acres) is managed for Roaded Modified experiences. In winter, the entire area is managed for semi-primitive motorized recreation experiences.

Traditional Cultural Properties and Sacred Sites: Four cultural resource sites have been found in the SCRA. The sites were surface scatters composed of lithics (chert and obsidian), waste flakes, and some artifacts.

Special Use Permits, Utility Corridors: Several special use permits (SUPs) have been granted for phosphate mine related uses, including a phosphate slurry pipeline along the northern boundary of the area, and a power line on the northeastern boundary of the area; an additional SUP is for the USFS radio repeater tower site (2 acres).

<u>Wilderness Attributes</u>

In addition to the roadless attributes described above, the SCRA is also characterized by the wilderness attributes described and summarized by the CNF (USFS 2003b).

Natural Integrity: Natural Integrity is the extent to which long-term ecological processes are intact and operating. Impacts to Natural Integrity are measured by the presence and magnitude of human induced change to an area.

Apparent Naturalness: Apparent Naturalness means that the environment looks natural to most people using the area.

The SCRA has been rated as low in Natural Integrity and Apparent Naturalness, as the area has been affected by the following physical or man-caused impacts: range improvements, prescribed fire, mineral exploration and development, and unimproved roads. Further, the appearance of man-made facilities or management activities in the area detract from the natural appearance because of grazing and recreation activities, timber harvest activities, roads, past fire history, and minerals.

Solitude/Remoteness: Solitude is a personal and subjective value, defined as isolation from the sights, sounds, and presence of others as well as human developments. A user's sense of Remoteness in an area is influenced by the presence or absence of roads, their condition, and whether they are open to motorized vehicles.

The opportunity for Solitude/Remoteness within the SCRA is low because of its small size, moderate topographic and vegetative screening, and moderate distances from the perimeter to the center of the area (USFS 2003b). The existing Smoky Canyon Mine occurs on the northeast side of the SCRA.

Primitive Recreation: Primitive recreation is a perceived condition of being secluded, inaccessible and out of the way. The physical factors that can create primitive recreation settings include topography, vegetative screening, distance from human impacts such as roads and logging operations (sight and sound), and difficulty of travel.

Primitive recreation opportunities are rated as moderate because of the small area of the SCRA, road corridors projecting into the area, moderate topographic and vegetative screening, and because limited facilities are present.

Challenging Experience: A Challenging Experience is described as one that requires self-reliance through application of woodsman and outdoor skills.

There are few opportunities for Challenging Experiences within the SCRA, as terrain is typical of the mountains in Southeastern Idaho.

Special Features/Special Places/Special Values: These consist of unique geological, biological, ecological, cultural, or scenic features that may be located in a roadless area.

Unique or special features are not represented within the SCRA.

Wilderness Manageability/Boundaries: These are elements that relate to the ability of the Forest Service to manage an area to meet size criteria (5,000 + acres) and the attributes discussed above. The shape of an area and changes of that shape influence how it can be managed.

The manageability of the SCRA along inventoried boundaries would be fair. Minor boundary adjustments could eliminate conflicts, including the Smoky Canyon Mine.

Meade Peak Roadless Area

Roadless Attributes

The MPRA is also described by the RACI resource attributes listed below and have been summarized from USFS 2003b.

Soil: Approximately 17 percent of the MPRA soils are considered unstable; about 64 percent of the area is considered an erosion hazard.

Air: The MPRA is outside the 20-mile sensitive receptor radius and is not within 200 kilometers of a Class I area. Nearby towns that are classified as sensitive air quality receptors are Montpelier and Soda Springs, Idaho (USFS 2003b).

Water/Sources of Public Drinking Water: No 303(d) streams are present in the MPRA and the northern portion (within the Study Area) is drained by Crow Creek.

Diversity of Plant and Animal Communities

Vegetation: Vegetation communities are composed of aspen, aspen/conifer, grass/shrub cover, and mixed conifer. A wildfire occurred in the early 1900's in the area. In addition, the Snowdrift area was treated with prescribed fire, and the Clear Creek and Home Canyon timber sales have occurred in these areas. As of 2003, approximately 1.4 percent of the MPRA contained invasive species. These species included Canada thistle, Dyers woad, and Musk thistle.

Wildlife and Fish: According to the Noss study, this area has some of the highest game values in Idaho. The MPRA was ranked moderate for wildlife biological strongholds during the resource management plan analysis. In addition, the departure from PFC is moderate (USFS 2003b). Approximately 52 percent of the area has grass/shrub cover, which is within five miles of the nearest sage grouse leks (5 miles). Fisheries biological strongholds are rated high because of the presence of YCT in Crow Creek that drains into the Snake River Basin and Bonneville cutthroat trout in Preuss Creek (south of the Study Area) that drains into the Bear River Drainage.

Threatened, Endangered, Sensitive, and Rare Species Occurrence/Habitat: Threatened and endangered species known to occur in the area include the gray wolf and lynx. The area is rated moderate for lynx linkage habitat because of the following factors: 1) the amount of security areas (31 percent); and 2) the major ridge along Snowdrift Mountain and the major drainage along the Montpelier drainage. Because of the moderate amount of security (27 percent), the MPRA also ranks moderate for wolverine and wolves. The northern goshawk has been documented in the MPRA. The area is rated low for forest-associated sensitive species but high for grass/shrub habitat-associated MIS.

Two proposed sensitive plants: Uinta Basin Cryptantha and Starveling milkvetch have been documented in the MPRA. Rare upland plant communities are found within the Meade Peak Research Natural Area (RNA) discussed in **Section 3.12.2**; the riparian/wetland communities around the Preuss Creek headwaters are considered plant community reference areas.

Reference Landscapes: The Meade Peak RNA and the Snowdrift prescribed fire treatment area could serve as unique reference values.

Scenic Integrity: High scenic integrity is maintained along and adjacent to Highway 30, the City of Georgetown, Idaho, and Crow Creek Road. Partial retention (moderate) is maintained on 28,457 acres, while Modification (low scenic integrity) is maintained on 13,084 acres.

Recreation (Semi-Primitive non-motorized and Semi-Primitive Motorized): The area is managed for both summer and winter recreation. In summer, 9,827 acres are managed for semi-primitive non-motorized recreation experience, while 11,403 acres are managed for semi-primitive motorized. In winter, a wildlife closure of 6,400 acres is managed as semi-primitive non-motorized. The remaining 34,277 acres are managed for semi-primitive motorized recreation experiences.

Traditional Cultural Properties and Sacred Sites: No information on Traditional Cultural Properties and/or Scared Sites has been documented within the MPRA.

Special Use Permits, Utility Corridors, Other: No special use permits or utility corridors are found in the area. There are 636 acres of State land in-holdings within this IRA.

Wilderness Attributes

In addition to the roadless attributes described above, the MPRA is also characterized by the wilderness attributes previously defined and described below.

Natural Integrity and Apparent Naturalness: The MPRA has been rated as moderate for both of these attributes because of the activities that have occurred within the MPRA and the evidence of human activities such as unimproved roads and timber harvests.

Solitude/Remoteness: The opportunity for Solitude/Remoteness within the MPRA is rated as moderate because of road intrusions into the area.

Primitive Recreation: Primitive Recreation opportunities are rated as moderate because of the small size of the MPRA, but there are many road intrusions.

Challenging Experience: There are few opportunities for Challenging Experiences within the MPRA, as terrain is typical of the mountains in southeast Idaho.

Special Features/Special Places/Special Values: The MPRA contains Meade Peak, the highest point on the CNF, and a Research Natural Area (discussed below). The area also includes good wildlife and fish habitat.

Wilderness Manageability/Boundaries: The manageability of the MPRA is considered poor due to the road intrusions into the area. A core area could be achieved, with boundaries along natural features.

3.11.2 Research Natural Areas

Research Natural Areas (RNAs) are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands (USFS 2003b). RNAs are for non-manipulative research, observation, and study. They also assist in implementing provisions of the National Forest Management Act, 1976 (USFS 2003a). Currently there are seven established RNAs on the CNF. None of the alternatives analyzed in this EIS are located inside any RNAs. Meade Peak RNA is the closest