Middle Panther Creek Watershed Analysis

Salmon/Cobalt Ranger District
Salmon-Challis National Forest
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Middle Panther Creek Watershed Analysis

Prepared by:

Betsy Rieffenberger –	Erosion Processes, Hydrology, Stream Channel and Water Quality
Lynn Bennett –	Forested Vegetation
Robert Rose –	Species and Habitats – Aquatic
Cindy Haggas –	Species and habitats – Terrestrial
Ray Henderson –	Human Uses
Tim Canaday –	Support – Human Uses
Gail Baer –	Writer/Editor

Accepted by:

Kimberly D. Nelson – District Ranger

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Date

Salmon/Cobalt Ranger District
Salmon, Idaho
Salmon-Challis National Forest

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Middle Panther Creek Watershed Analysis

Introduction

The Middle Panther Creek Watershed lies within the Panther Creek drainage. Panther Creek is part of the Middle Salmon-Panther Subbasin. Panther Creek is a tributary to the mainstem of the Salmon River and it enters the river downstream (west) of Shoup, Idaho.

There are four watersheds within the Panther Creek drainage: Upper Panther Creek, Middle Panther Creek, Napias Creek and Lower Panther Creek.

The Middle Panther Creek Watershed extends from below the confluence of Panther Creek and Moyer Creek downstream to below the confluence with Big Deer Creek with a drainage area of 117, 623 acres. The subwatersheds within the Middle Panther Creek Watershed include Woodtick Creek, Copper Creek-Panther Creek, Blackbird Creek, Deep Creek, Fawn Creek-Panther Creek, Little Deer-Panther Creek and Big Deer Creek (Map 1).

Characterization of the Watershed – Step 1

Step 1 of a watershed analysis is to characterize each resource by the resource specialists by identifying the dominant physical, biological, and human processes and features of the watershed that affect ecosystem function or condition. The following sections describe the watershed by individual resource features.

Climate

The Middle Panther Creek Watershed is located in a climate transition zone between the maritime climate of northern Idaho and the continental climate of southern Idaho. The Panther Creek drainage is affected by two basic storm patterns. During the winter, from November through March, most of the precipitation comes from low altitude cyclonic storms that move eastward from the Pacific Ocean. During May and June, most of the precipitation results from high altitude convectional storms moving northward from the Gulf of Mexico and the California coast. High intensity summer storms are very common in the lower Panther Creek drainage and less common in the Middle Panther Creek watershed.

The town of Cobalt, Idaho is located within Middle Panther Creek Watershed. A weather station was in operation at Cobalt from1962 to1986. Climatic records for Cobalt (elevation 5,010 feet) show the average annual precipitation as 17.8 inches. The wettest months are May and June when day long precipitation events are common. During late June through August the majority of the precipitation occurs as short duration, high-intensity thunderstorms. From

November through April most of the precipitation comes in the form of snow. The average temperature at Cobalt is 40.7 degrees Fahrenheit with and average daily maximum of 56 degrees Fahrenheit and an average daily minimum of 25 degrees Fahrenheit. Temperature extremes range from highs in the nineties to lows of minus 20 to 30 degrees Fahrenheit.

Geology and Landforms

The predominate parent material in the watershed is quartzite with small amounts of granite found in the Big Deer Creek drainage. There are some small intrusions of Challis-volcanics in the Blackbird Creek and Deep Creek subwatersheds. The geology and landtype associations in the watershed are shown in Map 2.

The headwaters of Woodtick Creek and Big Deer Creek have been modified by alpine glaciation. Cirques, cirque basins, headwalls and ridges adjacent to the cirques have been carved by glaciers. U-shaped valleys in these glacial areas have been carved and shaped by moving valley glaciers. These valleys have steep concave sideslopes and gently sloping, wide valley bottoms.

Cryic uplands are found on broad, gently sloping ridge tops and mountain slopes at elevations above 6500 feet. The dominant slope forming process has been the action of freezing and thawing. This landtype association does not show evidence of glaciation, however the influence of glacial climates has been an important factor in their formation. Slopes on this landform are relatively gentle with gradients in the range of 15 to 50 percent.

In the middle and lower elevations within the watershed the dominant landforms are mountain slopelands that have been formed by fluvial processes. The mountain slopelands have steep slopes with slope gradients in the range of 40 to 65 percent. Slopes in this landtype association may be smooth or may be dissected by V-Shaped drainages. This association is usually found in the elevation range of 4,000 to 6,500 feet.

Steep canyonlands are found adjacent to Panther Creek and lower Big Deer Creek and Deep Creek. This landtype association has been formed by stream cutting action. Slopes range from 60 to 90 percent and are dissected by shallow parallel drainages. Rock outcrops and talus slopes are common in this association. The valley bottoms may range from narrow valley bottoms in which the stream is actively cutting its channel in bedrock to wide valley bottoms in which the stream is meandering across depositional material. This association is usually found below 6,000 feet.

The majority of the valleys in the watershed are V-shaped with narrow valley bottoms and steep sideslopes. Wider alluvial valleys are found along some reaches of Panther Creek, Big Deer Creek and the lower reach of Deep Creek. The predominate stream type would be a B4 with narrow, colluvial valleys, slopes in the range of 2 to 4% and substrates dominated by gravel with lesser amounts of boulders, cobble and sand (Rosgen, 1996).

Soils in the watershed are highly variable depending on the parent material, slope and aspect. Soils developing from quartzite parent material are generally stable and have a high content of gravel, cobble and stone. Soils in the areas of granite geology are light to medium textured with high amounts of coarse fragments. The granitic soils are more erosive than the quartzite soils,

due to their coarse texture. The soils derived from the Challis volcanics are variable, but in general are heavy textured and have a higher risk of mass movement than either the quartzite or granitic soils.

Erosional and Hydrologic Processes

Hillslope processes in the Middle Panther Creek Watershed include surface erosion, overland flow and the infiltration and movement of water downslope. Surface erosion, including sheet erosion and rilling, is the dominant process for movement of soil particles downslope. The rate of surface erosion is dependent on the inherent erodibility of the soil, precipitation amounts and the vegetative cover and/or litter on the soil surface. Infiltration is dependent on the soil texture and the amount and type of vegetative cover. The amount of infiltration influences the vegetation and contributions to subsurface flow. Changes in the density and type of vegetation can change precipitation interception and transpiration rates. Significant changes in vegetation density or type can affect streamflows by changing infiltration and transpiration rates.

The streamflow regime in the Middle Panther Creek Watershed is typical of snowmelt dominated streams in the Salmon River drainage, exhibiting large fluctuations between baseflow and peak flows. Peak flows from snowmelt occur in late May or June and baseflows predominate from late summer through March. Mean annual and mean monthly stream flows for major streams in the Middle Panther Creek Watershed are shown in Table 1.

Table 1. Mean Annual Flow for major streams in the Middle Panther Creek Watershed

Stream	Drainage Area (sq. miles)	Mean Annual Flow (cfs)	Mean Monthly Flow (cubic feet per second)											
			J	F	M	A	M	J	J	A	S	O	N	D
Blackbird Creek	20.8	12.0	3.8	3.8	4.2	8.6	35	48	15	6.5	5.1	5.0	4.5	4.1
Big Deer Creek	45.9	35.8	11	11	12	26	104	144	45	19	15	15	14	12
Deep Creek	37.1	19.9	6.3	6.3	6.9	14	58	80	25	11	8.5	8.2	7.5	6.8
Little Deer Creek	6.3	2.8	0.9	0.9	1.0	2.0	8.1	11	3.5	1.5	1.2	1.1	1.0	0.9
Panther Cr above Middle Panther Watershed	63.9	30	9.5	9.4	10	22	88	120	38	16	13	12	11	10
Panther Cr at mouth	529.0	258	82	81	90	186	753	1035	324	140	111	107	98	89
Woodtick Creek	16.0	9.0	2.9	2.8	3.1	6.5	26	36	11	4.9	3.9	3.7	3.4	3.1

Data Source: Mean annual flows were developed from regional regression equations in the US Geological Survey Report #82-865, An Evaluation of Streamgauging Networks.

Forest Vegetation

Conifers interspersed with small clumps or stringers of deciduous trees and mountain grasslands characterize the landscape. Forest vegetation is comprised of Douglas-fir, lodgepole pine, ponderosa pine, subalpine fir, Englemann spruce and whitebark pine. Aspen and cottonwood deciduous trees are found in small patches and moist areas. Understory vegetation varies in abundance and diversity, depending on the site. The forested vegetation within the assessment area can be placed in two potential vegetation groups (PVGs); Dry Forest or Cool Forest (Quigley et al, 1997), Map 3 and 4.

The Dry Forest PVG occupies the lower elevations and mid elevations, usually on south or west facing slopes. Douglas-fir and scattered ponderosa pine are the common cover type and some areas may have sagebrush interspersed with the conifers. Historically, the trees were usually large diameter, widely spaced and were maintained by frequent fire. Fuel loads were light to moderate. Understory vegetation composed of grasses and shrubs was sparse. In the current landscape Douglas-fir is encroaching into the sagebrush sites because of lack of disturbances such as fire.

On north facing slopes, the vegetation becomes denser and the sites are moister and the Dry Forest PVG transitions to the Cool Forest PVG. Average tree diameters are smaller and more trees are found on a site. As the elevation increases, lodgepole pine and Douglas-fir are intermixed. At higher elevations subalpine fir and lodgepole pine comprise the conifer mix. These landscapes were maintained by fire at less frequent intervals creating extensive areas of lodgepole pine. Fuel loads are generally light to moderate depending on stand density and increase as the trees mature and die. Ladder fuels are present in greater abundance than prior to fire suppression. At the highest elevations, whitebark pine is found in pure stands or intermixed with subalpine fir. These are harsh sites exhibiting slow growth and light to moderate fuel loads. Lethal fires were at longer intervals. White pine blister rust is present in the whitebark pine sites in the watershed.

Englemann spruce and aspen may be found along streams and in moist areas. Englemann spruce is usually mixed with subalpine fir and has moderate to high fuel loads. These stands burn infrequently and the fire is usually lethal. Aspen and cottonwood are the primary deciduous trees in riparian areas. Aspen occurs at all elevations in more moist areas and cottonwood is found along streams at lower elevations. The understory vegetation in these moist areas is lush and diverse. Livestock grazing and a lack of disturbance have decreased the amount of aspen in the watershed.

Logging of various types has occurred over some of the watershed as well as fire suppression. This has changed the landscape patterns from the natural range of variation.
Douglas-fir bark beetle, spruce budworm and mountain pine beetle are presently at epidemic levels. Mistletoe is present in Douglas-fir and lodgepole pine with extensive amounts present in Douglas-fir at lower elevations.

Fire History

The Clear Creek fire burned in the summer of 2000 and was approximately 160,000 acres. Roughly 56,400 acres of the Clear Creek fire burned in Middle Panther Creek watershed, Map 5 and 12. An analysis of the fire (Table 2) shows that 51% of the forested ecosystems incurred lethal fire severity, converting mid and late succesional forests to seedling stands. Eighteen percent of the forested ecosystems incurred a mixed severity fire, killing portions of both understory and overstory trees, but not the entire stands. 21% incurred a low severity fire, which generally results in a surface that thins the understory tress and kills minor amounts of the overstory trees. This wildfire altered much of the vegetative structure in the forested ecosystems on the west side of the Middle Panther Creek watershed.

Table 2 -- Burn Severity for Clear Creek Fire

Fire Name	Fire size (acres)	Unburned NDBR Class 1	Low severity NDBR Class 2	Mixed severity NDBR Class 3	Lethal severity (lethal surface & crown fire) NDBR Class 4 & 5
Clear Creek	160,000	10%	21%	18%	51%

Species and Habitats

Fish and Fisheries Habitat

The Middle Panther Watershed supports 122 miles of perennial streams, with 95 percent of this mileage located on National Forest System lands. Large stream size, availability of low gradient stream reaches, and diversity of aquatic habitats within the watershed provide for significant fisheries production potential. Cirque basins within high elevation portions of the watershed additionally support three alpine lakes. The watershed supports populations of resident salmonids including native rainbow, westslope cutthroat, and Federally-threatened bull trout, as well as introduced brook trout. Anadromous runs of Federally threatened Chinook salmon and steelhead, estimated to have once numbered several thousand fish annually in Panther Creek, have, however, been dramatically reduced by factors occurring both within and outside the watershed including mining, timber harvest, grazing, wildfire and water diversion. The legacy of past mining activities within the Blackbird and Big Deer drainages of the watershed has produced the most significant and far-reaching impacts on Panther Creek's fisheries resources and habitats.

In 1995, the Salmon National Forest amended its Forest Plan to incorporate aquatic habitat management direction identified within the joint Forest Service/Bureau of Land Management guidance document Interim Strategies for Managing Anadromous Fish-Producing Watershed in Eastern Oregon and Washington, Idaho and Portions of California, also known as PACFISH. Because of its significant fisheries production potential, the Middle Panther Creek Watershed is designated as a PACFISH priority watershed, emphasizing restoration of its fisheries resources

and aquatic habitats as a primary management direction. All perennial waters within the watershed have additionally been designated as critical habitat for Federally-threatened Snake River spring/summer Chinook salmon, and mainstem Panther Creek and seven of its tributary streams have been designated as critical habitat for federally threatened Snake River Basin steelhead.

Terrestrial Habitat

The Middle Panther Creek watershed has a wide array of wildlife habitats, ranging from sagebrush/bunchgrass communities with scattered ponderosa pine at the lower elevations on south or southwest aspects to whitebark pine and subalpine communities at the upper elevations. Alpine habitats are found in the western portion of the area within the Bighorn Crags and on Lake Mountain along the eastern boundary. Relatively large expanses of continuous forested communities, primarily Douglas-fir, lodgepole pine and subalpine fir, occur throughout the upper portions of the entire watershed. Scattered aspen stands represent a minor component of the landscape but are present across the watershed. These aspen clones, though not abundant, provide important habitat for many species of mammals and birds, including many resident species as well as neotropical migratory songbirds.

Non-forested habitats consist primarily of sagebrush/bunchgrass communities with bluebunch wheatgrass dominating south aspects while Idaho fescue is found on north aspects and higher elevations. Impacts from domestic livestock grazing have been largely confined to areas north and east of Panther Creek within the Williams-Napias C&H allotment. Areas west of Panther Creek including Big Deer Creek to the southern boundary of the watershed are not included in any current livestock grazing allotment. Noxious weeds, especially spotted knapweed and cheatgrass, occur in select areas and knapweed populations are established along some roadways.

Numerous natural lakes occur in cirque basins in the headwaters area of Big Deer Creek on the east side of the Bighorn Crags within the Frank Church River of No Return wilderness. These lakes, due to their high elevations, provide very little waterfowl nesting habitat. However, many species of waterfowl use them as rest stops during seasonal migrations. Habitat is also available for mountain goat, pika, marmot and bighorn sheep in the cirque basins.

Riparian areas, largely dominated by conifers with limited shrub communities, are also interspersed through the area. These communities have been influenced by private land activities largely along the Panther Creek road, established roadways such as the Panther Creek Road and the deleterious effects of past mining activities along Blackbird and Bucktail Creeks.

This watershed provides optimal quality summer habitat for elk, mule deer and bighorn sheep. Bighorn sheep are known to be in the northern portion of the watershed. Acceptable habitat is available for mountain goat in the vicinity of Lake Mountain, along the east side of Panther Creek below Napias Creek and within the Bighorn Crags. Although several drainages have been fragmented by timber harvest activities and road construction, many of these road systems are closed yearlong and provide important security areas for big game.

Dense subalpine fir habitats coupled with mid–sized shrub understory and woody debris provide good habitat components for Canada lynx in some high elevation areas. Five Lynx Analysis

Units (LAUs, Map 6) that contain mapped lynx habitat compose approximately 54% (63263ac/117708ac) of the total watershed, Table 3. Most of the mapped habitat is found within the Deer Cr LAU in the northwest portion of the watershed.

Table 3 Mapped Lynx Analysis Units, Middle Panther Creek Watershed

LAU NAME	ACRES OF MAPPED HABITAT
Arnett	3,372.1119
Blackbird	13,653.9931
Deep Creek	15,401.6026
Deer Creek	18,741.8672
Woodtick	12,093.0247
TOTAL ACRES	63,262.5995
TOTAL WATERSHED AC	117,708.0000

Species of special status (Table 4) that may occupy the watershed for all or a portion of the year include wolverine, fisher, western big-eared bat, boreal owl, flammulated owl, great gray owl, northern goshawk, bald eagle, peregrine falcon, harlequin duck, greater sage-grouse, pileated woodpecker, three-toed woodpecker and Columbia spotted frog. At least two wolf packs (ie, Jureano and Moyer Basin) are well established in the area, and the likelihood of another (ie, Hoodoo) moving into the Panther Cr area is a realistic possibility. Scattered populations of Lemhi penstemon are known to occur in upland habitats along Panther Cr.

Table 4. List of Special Status Species for the Middle Panther Cr Watershed Analysis Area.

Salmon-Challis National Forest Sensitive Species	**Management Indicator Species**	**Threatened and Endangered Species**
Spotted Bat ***Euderma maculatum***		
Western big-eared bat ***Corynorhinus townsendii pallescens***		
Wolverine ***Gulo gulo***		
Fisher ***Martes pennanti***		
Pygmy rabbit ***Brachylagus idahoensis***		
		Gray wolf *Canis lupus*
		Canada lynx *Lynx canadensis*
Harlequin Duck ***Histrionicus histrionicus***		
Northern Goshawk ***Accipiter gentilis***		
Bald Eagle *Haliaeetus leucocephalus*		
Peregrine falcon ***Falco peregrinus anatum***		
Greater sage-grouse ***Centrocercus urophasianus***	**Greater sage-grouse** ***Centrocercus urophasianus***	
Great Gray Owl ***Strix nebulosa***		
Boreal Owl ***Aegolius funereus***		
Flammulated Owl ***Otis flammeolus***		
Three-toed Woodpecker ***Picoides tridactylus***		
Columbia spotted frog ***Rana luteiuentris***	**Columbia spotted frog** ***Rana luteiuentris***	
North Zone sensitive plant species		
Pink Agoseris ***Agoseris lackschewitzii***		
Flexible alpine collomia ***Collomia debilis v. camporum***		
Douglass" Biscuitroot ***Cymopterus douglasii***		
Lemhi Penstemon ***Penstemon lemhiensis***		
Salmon Twin Bladderpod ***Physaria didymocarpa v. lyrata***		
Marsh's Bluegrass ***Poa abbreviata v. marshii***		
Idaho Range Lichen ***Xanthoparmelia idahoensis***		
	Pileated woodpecker *Dryocopus pileatus*	

Big game winter range is also available within the open grassland slopes located along both sides of Panther Creek, and in low to mid-elevations of all tributaries. This is especially evident in Deep Creek where large open grassland communities are found. Scattered mountain mahogany communities provide important forage and cover for wintering big game. Many of the drainages located west of Panther Creek and north to Jureano Mountain were impacted by high severity fire during the Clear Creek wildfire of 2000. Impacts from the fire have been responsible for the conversion of coniferous overstory to grassland/shrub communities and have subsequently provided additional forage areas for big game.

Historic mining and a recent major forest fire in the watershed area have had large scale effects on current habitat conditions and wildlife activities. These two significant events have influenced wildlife habitat primarily west of Panther Creek and north of Napias Creek. From the late 1800's and into the 1980's the Blackbird Mine operated at varying levels of activity. Over those years of operation mine portals were established, large tailing areas created, access roads constructed and exploration activities conducted. The combination of these activities has resulted in considerable disturbance in the area. Regularly used and maintained roads are common and there are numerous exploration roads and pits in the area.

The second and more dramatic influence was the Clear Creek Fire in 2000. The Clear Creek Fire is the first large fire in the watershed area since fire history records have been maintained. Approximately 56,400 acres burned in the watershed and nearly 50% was severely burned resulting in stand replacement conditions, Map 12. As habitat in a majority of the watershed west of Panther Creek was significantly altered wildlife activities in the area became different than what existed prior to the fire. Wildlife use of burned areas has been low to variable, but will likely stabilize over time as seral communities become better established and the natural process of succession continues. Much of the watershed area impacted by the Clear Creek Fire was heavily forested before the fire occurred

Human Uses

The Middle Panther Creek Watershed has a long history of human use. Today the Shoshone-Bannock and the Nez Perce Native American tribes continue to exercise treaty rights within the Middle Panther Creek Watershed. These reserved rights include hunting, fishing and gathering. These rights are protected on all open and unclaimed lands ceded by the Shoshone and Bannock people to the United States government under the 1868 treaty of Fort Bridger and the Nez Perce treaty of June 9, 1855.

Traditional non-recreation uses of this watershed include mining, livestock grazing, timber harvest and the gathering of forest products. Mining has played a significant role in the development of the Middle Panther Creek Watershed. The Blackbird Mine operated at varying levels of activity from the late 1800's into the 1980's. During the peak of the mining activity at the Blackbird Mine the townsite of Cobalt was occupied

and a variety of services were available at the town including a service station, bowling alley and grocery store.

Recreation uses within the watershed include two developed campgrounds, dispersed recreation and firewood gathering. Dispersed recreation includes camping, hunting and fishing activities and trail riding. Several popular trails that provide access to the Frank Church River of No Return Wilderness are located in the watershed.

Issues and Key Questions – Step 2

The purpose of this step is to focus the analysis on the key elements of the ecosystem that are most relevant to the management questions, human values, or resource conditions within the watershed. Specific key questions were reviewed and developed to address each issue.

Climate, Geology, Landforms, Erosion and hydrologic Processes:

Issues

Effects of human uses on watershed health

- Effects of past mining activities on water quality and aquatic resources
- Effects of livestock grazing on riparian areas and streambank stability
- Effects of wildfires on riparian areas and water quality

Key Questions

- What is the current condition of streams, riparian areas and water quality in the watershed?
- How have human uses affected the condition of the streams, riparian areas and water quality?

Forested Vegetation Structure and Composition (Forested Conifer Ecosystems):

Issue

Under natural conditions, vegetation structure and composition have a high degree of resiliency and diversity. Past human activities and natural processes have changed forested communities. These changes may affect ecosystem function and overall sustainability.

Core topics addressed: forested vegetation

Key Questions:

- How has fire suppression, fire exclusion, timber harvest, silvicultural practices and grazing affected vegetation structure, composition and ecosystem process of forested vegetation?
- How has the change in forested vegetation structure and composition affected the risk associated with wide spread wild fire and the ability to suppress forest fires adjacent to human developments (wildland urban interface)?

Fisheries and Fish Habitat:

Issue

Effects of human uses on fish and wildlife resources and habitats

Key Questions

- What is the relative abundance and distribution of wildlife and fish species of concern that are important in the watershed?
- What is the current habitat condition and trend for species of concern?
- What was the historical relative abundance and distribution of species of concern, as well as the condition of their habitats in the watershed?
- What are the influences and relationships of species and their habitats with other ecosystem processes in the watershed?
- What species and habitats are being affected by human uses?
- What are the natural and human causes of change between historical and current species distribution and habitat quality within the watershed?

Terrestrial Habitat:

Issue

Changes in Terrestrial Species and Habitat - Under natural conditions, habitat and species populations have a high degree of resiliency and diversity. Existing and past human uses and natural processes have caused changes to habitat and associated species. These changes may have affected the amount and distribution of habitat and population numbers, which may have reduced the overall sustainability of species and their habitat.

Core topics addressed: species and habitats

Key Questions

- How have management-practices affected habitat conditions and species distribution in the watershed for terrestrial species?

Human Uses:

Issue

There have been shifts in major human uses, including tribal uses and treaty rights in the watershed through time.

Key Questions

- How have the presence and activities of other user groups affected historic and current uses by Native Americans?
- What are the effects to treaty resources from past and current resource uses within the area?
- What are the current and past uses and interests of the Shoshone-Bannock Tribes and Nez Perce Tribe within the watershed?
- What opportunities exist to work in partnership with Native Americans to meet watershed, riparian and fish restoration goals?

Issue
What is the current condition and trends of the prevalent human uses in the watershed?

Key Questions

- How have human use patterns and trends in the watershed changed over time?
- What is the trend in commodity uses in the watershed?
- What is the status and trend of non-commodity uses, such as recreation, in the watershed?

Description of Current Conditions (Step 3)

This step describes the current condition of the watershed for each resource in more detail than in the Characterization of the watershed.

Climate, Geology, Landforms, Erosion and hydrologic Processes

This section discusses the current condition of streams, riparian areas and water quality in the Middle Panther Creek Watershed relevant to the issues and key questions listed above.

Hydrologic Condition of Streams and Riparian Areas

The hydrologic condition of the streams and riparian areas in the Middle Panther Creek Watershed is highly variable, ranging from streams that are in good condition with stable streambanks and functioning floodplain/riparian areas to streams that are highly unstable with adjacent riparian areas that are not functioning properly. Following is a discussion of the current condition of the streams in the subwatersheds within the Middle Panther Creek watershed.

Woodtick Creek Subwatershed

Woodtick Creek has a drainage area of 16 square miles. Mean annual flow in Woodtick Creek is 9 cubic feet per second (cfs) (Table 1). Human uses and activities in the Woodtick Creek subwatershed include dispersed recreation, livestock grazing (Map 7), timber harvest and fuels treatments. A long term monitoring station has been established on Woodtick Creek to evaluate the level of fine sediment and streambank stability. The sediment data collected at this station in the last ten years is displayed in Table 6.

The level of fine sediment at this site has ranged from approximately 8 to 25%. This stream has met the Forest Plan goal for sediment levels for resident fish streams (< 28.7% fine sediment) in all years and has met the goal for anadromous fish streams (<20% fine sediment) every year except for 2008. Streambank stability has ranged from 86 to 100 percent and has met the Forest Plan desired condition (Pacfish amendment) for streambank stability of >80% stable banks (Table 7).

Copper Creek-Panther Creek Subwatershed

Named streams within the Copper Creek-Panther Creek subwatershed include Dummy Creek and Copper Creek. This subwatershed has a drainage area of 10,662 acres. Both Copper Creek and Dummy Creek enter Panther Creek in the vicinity of the Cobalt Ranger Station.

Copper Creek is a relatively small perennial stream. Human uses in the drainage include timber harvest, livestock grazing (Map 7) and historic mining activity. A copper mine and mill were located in upper Copper Creek. In 2002 a reclamation project was completed in Copper Creek to remove safety hazards at the old mill building. The mill and associated structures were removed and reclaimed during this effort. Some mine

waste (mill tailings) are still stored within the floodplain of Copper Creek. No immediate water quality concerns have been identified with the storage of this mining waste.

Dummy Creek is a very small perennial stream that enters Panther Creek downstream of the Cobalt Ranger Station. Human uses in the Dummy Creek drainage include timber harvest and dispersed recreation. A significant portion of this drainage was burned in the Clear Creek Fire of 2000 (Map 5). In 2008 during snowmelt runoff the Dummy Creek culvert on the Panther Creek Road was blocked by bedload deposits resulting in some minor flooding of the road and Ranger Station. A field review of the blocked culvert identified that the stream had probably been pushed to the north a long time ago when the Ranger Station was constructed. Currently the stream channel has a tight bend just above the Panther Creek Road resulting in a location that is prone to bedload deposition and channel migration. A solution that has been discussed in the field is moving the channel back to the south to straighten the approach above the road crossing.

Table 6 Level of fine sediment in streams in Middle Panther Creek Watershed

Mean percent fines (<0.25 inch) at depth										
Stream	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Big Deer at mouth	19.0		23.4			18.4				
Big Deer below SF			30.7	29.0	14.8	17.8	15.5	18.9	9.1	
Big Deer above SF			23.5	29.6	26.1	24.4	20.9		14.2	
Deep Creek at mouth	12.0	21.5	14.9	16.2	11.3	15.1	11.7	17.4	8.6	23.4
Little Deer Creek at mouth			11.3	13.2	13.8	10.1	8.3			
Panther above Mid Panther Watershed	23.6	24.0	19.3	18.4	22.9	17.7	11.4	20.4	10.6	20.1
Panther below Mid Panther Watershed	29.8	29.5	29.5	29.9	30.2	25.1	23.8			
Woodtick Creek	17.2		18.3					8.0	7.8	25.3

Table 7 Streambank Stability in streams in Middle Panther Creek Watershed

Percent Stable Streambanks										
Stream	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Big Deer at mouth	98		63	91						
Big Deer below SF			94	90	98	91	88		96	
Big Deer above SF			88	95	99	95	94		100	
Deep Creek at mouth	96	91	98	98	96	98	96	92	90	99
Little Deer Creek at mouth			22	58	76	84	84			
Panther above Mid Panther Watershed	75	76	93	81	87	96	89	100	93	91
Panther below Mid Panther Watershed	86	45	55	97	88	100	100			
Woodtick Creek	98		99	86		100		96	100	100

Blackbird Creek Subwatershed

Blackbird Creek has a drainage area of 20.8 square miles. Mean annual flow in Blackbird Creek is 12 cfs (Table 1). Blackbird Creek has been severely impacted by historic mining activity. The Blackbird Mine site is an inactive mine with about 14 miles of underground workings, a 12 acre open pit, 4.8 million tons of waste rock deposited in numerous piles and two million tons of tailings that are disposed of in a tailings impoundment on the West Fork of Blackbird Creek.

The Blackbird Mine site straddles the watershed divide between Blackbird Creek and Big Deer Creek resulting in impaired water quality and degraded aquatic habitat in both drainages. Acid rock drainage from waste rock piles, underground workings, a historic tailings impoundment and tailings deposited along streams have resulted in the release of elevated levels of hazardous substances to the groundwater and surface water in both the Blackbird Creek and Big Deer Creek drainages. These releases have caused elevated levels of copper and cobalt in both Blackbird Creek and Big Deer Creek and downstream in Panther Creek. Contaminated soil, sediments, waste rock and tailings were also released from the Blackbird mine site during high flows and are deposited along the streambanks of Blackbird Creek, Big Deer Creek and its tributaries Bucktail Creek and the South Fork of Big Deer Creek, and along Panther Creek.

Cleanup actions have been conducted and are ongoing at the Blackbird Mine site to address the releases of contaminants and the injuries to natural resources that resulted from the releases. In 1995, the current owners of the Blackbird Mine, Noranda Mining,

Inc., and the previous mine owners/operators settled litigation brought by the United States and the State of Idaho under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Clean Water Act, the Endangered Species Act and State law. Under a 1995 Consent Decree, the companies agreed to take response actions at the site to clean up the contamination and to implement a detailed natural resources restoration plan.

A Record of Decision (ROD) for the site was issued in 2003, and the Blackbird Mine Site Group (BMSG) is currently implementing the remedy outlined in the ROD under a Unilateral Administrative Order issued by the Environmental Protection Agency. There have been significant improvements in water quality as a result of the ongoing cleanup actions and water quality standards are currently being met most of the time.

The primary objective of the Blackbird Mine cleanup is the achievement of the copper and cobalt water quality standards in Big Deer Creek and Panther Creek downstream of Blackbird Creek and Big Deer Creek. During evaluation of the water quality problems downstream of the Blackbird Mine it was determined by the State of Idaho, and concurred by EPA, that it was technically infeasible to clean up Blackbird Creek and Bucktail Creek (tributary to S.F. Big Deer/Big Deer) to the aquatic life standards. It was determined that the beneficial uses of these two streams could not be restored so the cleanup goals are to achieve water quality standards in the South Fork of Big Deer Creek, Big Deer Creek and Panther Creek so that all life stages of salmonids may be sustained. Blackbird Creek is listed as an impaired water body (303(d) stream) by the State of Idaho, however the State of Idaho has not done a Total Maximum Daily Load (TMDL) allocation for Blackbird Creek due to the ongoing cleanup actions (Table 8).

Panther Creek receives metal loadings from Blackbird Creek and has been impaired by these loadings. However, Panther Creek is a much larger stream than Blackbird Creek and metal concentrations in Panther Creek are much lower than Blackbird Creek. As a result of the ongoing cleanup efforts water quality in Panther Creek has improved significantly over the last decade. Table 9 displays cobalt and copper concentrations in Blackbird Creek and Panther Creek below Blackbird Creek from 1995 to 2005.

As a result of the releases of hazardous substances from the Blackbird Mine the Blackbird Creek stream channel, riparian area and floodplain have been adversely impacted. Contaminated sediments are found all along the Blackbird Creek channel and in the floodplain as a result of historic mining practices, such as breaks in the tailings pipe and direct routing of tailings down the Blackbird Creek channel to an impoundment along the stream near the West Fork of Blackbird Creek tailings impoundment. Riparian vegetation along Blackbird Creek is lacking in vigor, density and distribution as a result of the deposition of contaminated sediments along Blackbird Creek. This lack of vigorous riparian vegetation has caused the stream channel/valley bottom to become very unstable and susceptible to bed, bank and valley erosion during high flow events.

Peak flows in Blackbird Creek during the 2008 snowmelt runoff deposited bedload in the active channel causing the stream to run down the Blackbird Creek Road and erode

segments of the road. The Salmon-Challis National Forest is currently working with EPA and the Blackbird Mine Site Group on a design to remove some of the bedload deposits from the floodplain to increase the channel/floodplain capacity and build up the road elevation to reduce the adverse effects of flooding in the Blackbird valley. Techniques to stabilize the road, channel and floodplain are being used in the restoration design. The flood event mobilized contaminated sediments from the Blackbird Creek channel and floodplain and deposited them along the Panther Creek floodplain. Actions to remove the sediments that exceed the human health limits established by EPA are currently underway along the Panther Creek floodplain downstream of Blackbird Creek.

The proposed Idaho Cobalt Project is located adjacent to the Blackbird Mine. The proposed workings and mining facilities are located in the Big Deer and Big Flat Creek drainages. The proposed mine would use the Blackbird Creek Road for access to the new mine site. Additional improvements to the Blackbird Creek Road would be required for the operator of the proposed mine site.

Table 8 Impaired Streams in the Middle Panther Creek Watershed

Streams Not Fully Supporting Beneficial Uses in the Middle Panther Creek Watershed			
Assessment Unit	Impaired Streams	Pollutants	Beneficial Uses Not Fully Supported
ID17060203SL005 03 Big Deer Creek- SF Big Deer to mouth	Big Deer Creek	Metals, pH and siltation	Cold Water Aquatic Life
ID17060203SL009 02 Bucktail Creek-source to mouth	Bucktail Creek	metals	Cold Water Aquatic Life
ID17060203SL010 05 Panther Creek- Napias Creek to Big Deer	Panther Creek	unknown	Cold Water Aquatic Life
ID17060203SL011 02/04 Panther Creek-Blackbird Creek to Napias Creek	Fawn Creek Spring Creek Panther Creek	Metals, copper and unknown toxicity	Cold Water Aquatic Life and Salmonid Spawning
ID17060203SL012B 02 Blackbird Creek-Blackbird Reservoir to mouth	Blackbird Creek	Metals, pH and siltation	Cold Water Aquatic Life

Data source: IDEQ 2002/2003 Integrated Report

Table 9 Water Quality in Blackbird Subwatershed and Panther Creek

Site Parameter	Date	Blackbird Creek below Water Treatment Plant	Blackbird Creek at mouth	Panther Creek below Blackbird Creek	Idaho Chronic Aquatic Life Criteria
Dissolved Cobalt (mg/l) Maximum	1995	5.81	1.85	0.269	None, but cleanup level for Blackbird CERCLA is **0.086 mg/l**
	2000	0.782	0.80	0.78	
	2005	0.17	0.493	0.02	
Minimum	1995	0.475	0.299	0.05	
	2000	0.193	0.117	0.019	
	2005	0.02	0.05	<0.01	
Dissolved Copper (mg/l) Maximum	1995	13.2	1.69	0.218	**0.0037 mg/l** based on hardness of 27 mg/l
	2000	0.26	0.063	0.025	
	2005	0.044	0.023	0.008	
Minimum	1995	0.782	0.213	0.0158	
	2000	0.183	0.008	0.003	
	2005	0.019	0.002	0.001	

Data Source: Water Resources Technical Report for the Idaho Cobalt Project (Hydrometrics, 2006).

Fawn Creek-Panther Creek Subwatershed

This subwatershed includes several small named and unnamed drainages that are tributary to Panther Creek and Panther Creek from the confluence with Copper Creek to the confluence with Quartz Gulch (Map1). Named streams include Fawn Creek and Spring Creek. Human uses in the subwatershed include timber harvest, livestock grazing (Map 7) and dispersed recreation. Some residential development has occurred on private land adjacent to Panther Creek and the Panther Creek Road.

Fawn Creek is a small perennial stream that is non-fish bearing. Spring Creek is an intermittent stream that was the source of potable water for the Cobalt townsite when it was still in existence. The mining company owned townsite has been dismantled and only a few structures remain on some parcels of private land owned by individuals rather than Noranda Mining Company.

Panther Creek, Fawn Creek and Spring Creek are all listed as impaired water bodies that are not fully supporting beneficial uses in the 2002/2003 Integrated Report prepared by

Idaho Department of Environmental Quality (IDEQ) (Table 8). The 2002/2003 Integrated Report identifies water bodies differently than previous 303(d) lists. The previous lists used "water quality limited segments" to identify streams and/or portions of streams that were impaired; in contrast the Integrated Report uses "assessment units". Assessment units are groups of similar streams within a subbasin that have similar land use practices, ownership, or land management. Representative streams or reaches were monitored within each assessment unit to determine whether or not the steams within the assessment unit are fully supporting their designated beneficial uses. If a stream within an assessment unit is impaired than all the streams within the unit are also listed as impaired in the 2002/2003 Integrated Report.

These streams are listed as not fully supporting beneficial uses due to contamination from the Blackbird Mine impacting water quality in Panther Creek and because of a low "habitat index" score on Spring Creek. Because Spring Creek is an intermittent stream it should not have been assessed during the beneficial use monitoring conducted by IDEQ. An intermittent stream would not be expected to have the same habitat quality as a perennial stream.

The Panther Creek Road is located in the valley bottom almost its entire length from the mouth of Panther Creek to a few miles below the Morgan Creek Summit. In some locations it is not encroaching on the stream or floodplain but in other locations it is encroaching on the stream. Throughout this subwatershed, particularly from Deep Creek upstream to Blackbird Creek, the Panther Creek Road has encroached on the floodplain. From the Cobalt townsite up to Blackbird Creek the road encroaches on the active channel and the road is flooded at high water events. This encroachment has resulted in reduced capacity for floodflows and a reduction in riparian vegetation and stream cover.

Deep Creek Subwatershed

Deep Creek has a drainage area of 37.1 square miles. Perennial streams within the subwatershed include Deep Creek and its tributaries, Pepper Creek and Little Deep Creek. Human uses in the subwatershed include timber harvest, livestock grazing, dispersed recreation and firewood gathering. Only a very small portion of this subwatershed was burned in the Clear Creek Fire (Map 5).

Deep Creek is one of the major tributaries of Panther Creek. Mean annual flow on Deep Creek is 20 cfs with mean monthly flows varying from a low of 6 cfs during the winter months to a June mean monthly flow of 80 cfs (Table 1). A long term monitoring station has been established on lower Deep Creek to evaluate the level of fine sediment and streambank stability. The data collected at this station in the last ten years is displayed in Table 6 and Table 7.

Sediment levels in Deep Creek have usually been low and the stream has met the Forest Plan goals for sediment most years. Streambank stability has always been high on this stream and has met the Forest Plan direction (Pacfish amendment) for streambank stability (>80%) all years. Deep Creek and its tributaries have all been determined to

fully support beneficial uses by IDEQ and no impaired streams have been listed in this subwatershed.

The Deep Creek Road provides year round access to the Panther Creek area, the residences along Panther Creek and to the Blackbird Mine. Currently a fish habitat improvement project is underway on Deep Creek to replace the culvert that was a fish passage barrier with a new structure that would facilitate fish passage. The new structure was designed using stream simulation principles to provide for a bankfull width channel with natural stream substrate.

Little Deer Creek-Panther Creek Subwatershed

This subwatershed includes several small drainages that are tributary to Panther Creek and the reach of Panther Creek from the confluence with Quartz Gulch down to the confluence with Big Deer Creek (Map 1). Perennial streams include Quartz Gulch, Big Jureano Creek, Little Jureano Creek, and Little Deer Creek. Human uses in the subwatershed include livestock grazing in the upper reaches of Big and Little Jureano Creek, firewood gathering and mining activity in Little Deer Creek and Big Jureano Creek. The Clear Creek Fire burned almost this entire subwatershed (Map 5).

Mining activity in Little Deer Creek was associated with the historic mining activity at the Blackbird Mine. Some abandoned adits, mine buildings and numerous exploration roads can be found in the upper reaches of Little Deer Creek. There are no known water quality problems associated with any of these mining features. Some placer mining was conducted in upper Big Jureano Creek in the past. Recent mining activity has included some placer exploration work to test to placer gravels adjacent to a fork of Big Jureano Creek. There are no known water quality problems associated with the historic placer mining activity in Big Jureano Creek.

A small intermittent stream, locally called Big Flat Creek, is located in this subwatershed and enters Panther Creek from the west between Little Deer Creek and Big Deer Creek. This stream is perennial in its headwaters then becomes intermittent in the middle reaches where it goes underground through an area of large talus rock. The upper portion of this drainage is located on a flat bench located north of the Blackbird Mine area. This flat bench is the proposed site for the mill, water treatment plant, administration buildings and the tailings/waste rock disposal facility for the proposed Idaho Cobalt Project.

In 2002 several debris flows from draws on the west side of Panther Creek partially blocked the Panther Creek channel pushing the stream into the Panther Creek Road. These draws drained areas burned in the Clear Creek Fire. An emergency action was taken to stabilize the Panther Creek Road. Large rock was placed for stabilization along the toe of the road to protect it from washing out. This road repair/bank stabilization treatment was successful and the road in this location has not eroded since the 20002 event.

The Little Deer Creek drainage was entirely burned in the Clear Creek Fire. A rain event in the fall of 2000 caused some channel scour and flooding in Little Deer Creek. A

monitoring station was established on Little Deer Creek in 2001 to monitor post fire effects on levels of fine sediment and streambank stability. Despite the higher post-fire flows in Little Deer Creek the levels of fine sediment have been low (Table 6). Streambank was very poor in Little Deer Creek following the flood event, but bank stability improved from 21% stable banks in 2001 to 84% bank stability in 2005 (Table 7).

The reach of Panther Creek within this subwatershed is listed as an impaired stream in the 2002/2003 Integrated Report. This reach is impacted by the poor water quality from Blackbird Creek and the Blackbird Mine. The State of Idaho has not done a Total Maximum Daily Load (TMDL) allocation for Panther Creek due to the ongoing cleanup actions at the Blackbird Mine.

Big Deer Creek Subwatershed

Big Deer Creek has a drainage area of 45.9 square miles. Mean annual flow on Big Deer Creek is 36 cfs with flows ranging from winter lows of 11 cfs to a June mean monthly flow of 144 cfs (Table 1). Perennial tributaries include the South Fork of Big Deer Creek and Bucktail Creek. The upper third of the drainage is located within the Frank Church River of No Return Wilderness Area. The majority of the subwatershed is either in wilderness or roadless areas. Numerous trails are located within this drainage providing access to the wilderness area. Human uses in the watershed include dispersed recreation and mining activity.

Water quality in Big Deer Creek has been severely impacted by releases of hazardous material from the Blackbird Mine. Facilities from the Blackbird Mine are located in Bucktail Creek, a tributary to the South Fork of Big Deer Creek. Existing mine facilities in this drainage include the Blacktail Pit, mine waste dumps, mine adits, mine roads, and water collection and transport facilities. Water collection facilities associated with the mine site cleanup include a dam at the 7000 foot elevation that routes contaminated water from the Bucktail drainage through underground workings to the Blackbird Creek drainage to a water treatment plant. As part of the ongoing cleanup effort at the Blackbird Mine site contaminated surface water, springs and groundwater are routed to the water treatment plant for treatment and discharge to Blackbird Creek.

Water quality in the Bucktail Creek/South Fork/Big Deer Creek area varies greatly depending on the proximity to historic mining sources in upper Bucktail Creek, the effects of the release of soluble metals from mining-impacted sediments, and dilution of metals by clean water sources, such as clean groundwater inflows and clean surface water from the upper reaches of both the South Fork and Big Deer Creek above the mine impact area. Cleanup actions taken by the Blackbird Mine Site Group have caused significant improvements in water quality throughout the drainage however the water quality standards are not being consistently met in Big Deer Creek.

The improvement in water quality in the Big Deer Creek subwatershed is illustrated in Table 10. In 1994/1995 copper concentrations in Bucktail Creek were on the order of

200 mg/l. By 2000, copper concentrations had declined approximately 100-fold. In 2002, IDEQ concluded, and EPA agreed, that Bucktail Creek could not be remedied to the point of meeting water quality standards in the foreseeable future (IDEQ, 2002). Although this conclusion may be right, it is apparent from the water quality data that a significant reduction in cobalt and copper concentrations in Bucktail Creek has been achieved.

Table 10 **Water Quality in Big Deer Creek Subwatershed and Panther Creek**

Site Parameter	Date	Bucktail Creek at mouth	South Fork below Bucktail Creek	Big Deer Creek below the South Fork	Panther Creek below Big Deer Creek	Idaho Chronic Aquatic Life Criteria
Dissolved Cobalt (mg/l) Maximum	1995	50.4	0.871	0.11	0.077	None, but cleanup level for Blackbird CERCLA is **0.086 mg/l**
	2000	1.54	0.089	0.011	0.031	
	2005	0.44	0.056	0.014	<0.01	
Minimum	1995	9.39	0.533	0.056	0.014	
	2000	1.20	0.056	0.005	0.005	
	2005	0.29	0.056	0.012	<0.01	
Dissolved Copper (mg/l) Maximum	1995	272	1.34	0.342	0.068	**0.0037 mg/l** based on hardness of 27 mg/l
	2000	1.16	0.16	0.021	0.015	
	2005	0.26	0.04	0.009	0.005	
Minimum	1995	40.9	0.23	0.144	0.021	
	2000	0.49	0.10	0.003	0.003	
	2005	0.21	0.04	0.008	0.002	

Data Source: Water Resources Technical Report for the Idaho Cobalt Project (Hydrometrics, 2006).

A Forest Service long- term monitoring station is located at the mouth of Big Deer Creek to measure the level of fine sediment and streambank stability. In 2001 two new stations were added on Big Deer Creek, one above and one below the South Fork of Big Deer Creek confluence, to obtain baseline data on sediment and streambank stability for the proposed Idaho Cobalt Project and to assess the effects of the Clear Creek Fire. The data for these stations is displayed in Tables 2 and 3. Sediment levels have been declining since the Clear Creek Fire and have met the Forest Plan goal for sediment levels for

resident fish streams (< 28.7% fine sediment) since 2003 and have met the goal for anadromous fish streams (<20% fine sediment) since 2005.

The proposed Idaho Cobalt Project would be located in the Bucktail Creek drainage. Proposed facilities in the Bucktail Creek drainage include underground workings, adit pads, an ore tram to the millsite, haul roads and a water discharge pipeline to Big Deer Creek.

Bucktail Creek is a 1.65 square mile drainage with 18.4 miles of road. The existing road density is 11.2 mile/square mile.

Forested Vegetation

I. Forest Potential Vegetation Groups

Table 11 displays how the potential vegetation types (PVTs) are lumped into potential vegetation groups PVGs) on the Salmon-Challis National Forest.

Table 11 **PVTs included in PVG Groupings:**

PVT	**PVG**
DF/LPP	Dry Forest
Douglas fir/LPP Gentile	Dry Forest
Dry DF w/out P Pine	Dry Forest
Dry DF w/P Pine	Dry Forest
Mtn. Big Sage w/conifer	Dry Forest
P Pine/Grassland	Dry Forest
Subalpine Fir Dry	Cold Forest
Subalpine Fir Dry Gentile	Cold Forest
Subalpine Fir Moist	Cold Forest
Subalpine Fir F/WBP	Cold Forest
WBP/Subalpine Fir	Cold Forest

A. Columbia River Basin-Potential Vegetation Groups

Dry Forest PVG (represents 67% of the forested ecosystems in the Middle Panther Creek landscape):
The Dry Forest PVG is limited by low moisture availability and is found at lower elevations on south or west aspects within the watershed. Since the implementation of fire suppression and traditional silvicultural practices, the Dry Forest PVG generally shifted to a predominance of mid-seral structures occupying approximately 55 percent of the landscape. In the current period, much of the Dry Forest PVG is dominated by a higher density of smaller-diameter trees due to the lack of thinning fires that accelerated the growth rates of fire survivors. The current period extent of the late-seral multi-layer structure (ofm) was at the upper end of its historical range (approximately 16%

composition). During the current period, early-seral forest structures generally occurred within their historical range, but areas that had been harvested were missing the scattered, large-diameter trees and snags. Current landscapes have a mixed composition rather than dominated by shade intolerant species. Fire intervals range from 40 to 80 years (Hann et al. 1997).

Douglas fir/lodgepole pine and Dry Douglas fir PVTs as well as Douglas fir and lodgepole pine cover types compose the dry forest type.

Cold Forest PVG (represents 33% of the forested ecosystems in the Middle Panther Creek landscape):
The Cold Forest PVG is found at higher elevations and is limited by short growing seasons. Many late seral multi layer forests have been harvested. The extent of late seral single layer forests did not change, but reduction in whitebark pine due to blister rust altered the composition. Early seral forests increased as a result of timber harvest which also removed much of the snag component. Mid seral forests are within the range of natural variability. Early seral and mid seral shade tolerant forests have increased from historical condition and shade intolerant mid seral forests have decreased. The ratio of shade tolerant to shade intolerant species in late seral forests has not changed dramatically from historical condition. Much of the cold forest is highly susceptible to tree mortality from fires, stress, insects and disease. Fire frequency interval is 75 to 300 years (Hann, et. al. 1997). Within the watershed, dry and moist subalpine fir and subalpine fir/whitebark pine PVTs as well as Douglas fir, lodgepole pine, subalpine fir, whitebark pine and Englemann spruce cover types compose the Cold Forest PVG.

II. Fire Ecology-Current Forest Vegetative Structures

A. Structural Stage for Dry Forest Potential Vegetation Group-Stepdown Columbia River Basin

In the dry forest ecosystems, 1991 data shows forest vegetative structural stage (SS) combinations as follows: 7% in ofs; 23 % in ofm; 47 % in a mixture of seo, sec, ur, and/or yfm; 22% in si; and 1% in non-forest (Hann *et al* 1997, pg 485). See Forested Vegetation Appendix A, Structural Stage Descriptions.

The composition of late-seral single-layer (ofs) shade-intolerant (ie, ponderosa pine) forest had declined by 25 percent from historical amounts. In addition, current period landscapes had a mixed composition rather than being dominated by shade-intolerant species. This was particularly true in areas that had been actively harvested and in areas where fire suppression has been effective. (Hann et al 1997, page 487).

Central Idaho (ERU 13) **Dry Forest PVG**: In the dry forest ecosystems, 1991 data shows forest vegetative structural stages (SS) combinations as follows: 2% in ofs, 19 % in ofm, 46 % in a mixture of seo, sec, ur, and/or yfm, 33% in si (Hann *et al* 1997, pg 565).

Hann (Hann et al 1997, pg 563) describes the current condition for the Columbia Basin as follows, "For the Dry Forest PVG, the late-seral single-layer forest type (ofs) was well below the historical range of variability (HRV), whereas the late-seral multi-layer forest type (ofm) occurred at the upper limit of the Issue A-26 HRV. The late-seral single-layer forest type (ofs) largely converted into the mid-seral (sec, ur, and yfm) forest type because of insect, disease, and stress mortalities in the overstory layer, and growth of shadetolerant layers in the understory. The aforementioned transitions occurred primarily as a result of fire exclusion. Fire exclusion substantially reduced the extent of the non-lethal and mixed fire regimes that maintained late-seral single-layer types, and that thinned shade-tolerant tree species in early-, mid-, and late-seral multi-layer types. Timber harvest activities largely occurred in the peripheral areas of the Central Idaho ERU, where the larger, shade-intolerant tree species were those primarily selected for harvest. These trees were more resistant to insect, disease, and stress mortality. Clearcutting and seed tree timber harvest activities commonly created small patches of early-seral structures containing few live or dead-standing trees, and high down fuel accumulations." Similar trends are occurring on the S-C National Forest.

S-CNF Dry Forest PVG: There has been substantial change in small tree stocking densities per acre in these sites. In the ofms and ur stands, high numbers of seedling, sapling, and pole size trees can often be in patches or clumps. As fire exclusion has continued, these clumps of heavily stocked smaller trees continue to expand and occupy more and more of the area resulting in a substantial increase in the average number of small trees per acre. Studies on the North Fork District (Salmon-Challis National Forest) reflect this trend. Tree data gathered in the dry forest types Gibbonsville area (USDA 2000, pg 14) displayed substantial increases in small diameter trees per acre. Today, these smaller diameter trees are the ladder fuels that now allow surface fires to climb (ladder) up into the overstory trees crowns and facilitate crown fires. The ladder fuels ranged up to 30 feet or more in height. Regarding the study around Gibbonsville, Hoyt stated, "Ladder fuel height is probably the most significant single factor found in the survey that will affect the potential fire behavior in any of the project stands."(USDA 2000, pg 14).

Middle Panther Creek Area Dry Forest PVG: The current structural stages are displayed in Table 12. In the analysis area, much of the historical Dry Forest PVG (dry Ponderosa pine and Douglas-fir sites) were similar in structure and disturbance regimes as the ponderosa pine/Douglas-fir sites on the north end of the Salmon-Challis NF and in the Bitterroot Valley. The ofm averaged around 10% in the historical Middle Panther Creek Area landscape. In the current Middle Panther Creek Area landscape the ofm occupies 29% of the dry forest type. The ofs averaged around 15 to 40% in the historical Middle Panther Creek Area landscape. In the current Middle Panther Creek Area landscape the ofs occupies 15% of the dry forest type.

These changes in forest structure have greatly increased the area in which ladder fuels may promote crown fires. The two forest structures that contain the most ladder fuels and increase the risk of crown fire are ofm and ur. Combined, they make up 47% of the Dry Forest PVG.

The increase in the number of acres of the si structural stage (due to the Clear Creek wildfire of 2000) has increased the amount of the landscape that will not support extreme wildfire behavior. These areas now lack an overstory of trees that would support a crown fire. These areas do contain relatively high amounts of grass/forbs and down dead trees that can provide fuels for fast moving surface fires. Such wildfires would be lethal to any existing tree seedlings or saplings. Also, the shifts (historical vs current) in multi-canopy structural stages vs single canopy have reduced the area where understory fires could burn under larger trees and not result in crown fires. This is reflected in the amount of ofs (15%) in the current landscape vs the amount of historical (15 – 40%). Open understory forest have been replaced with forests supporting high amounts of ladder fuels or due to lethal severity wildfires stands of seedling (which are not fire resistant or resilient).

Table 12 Existing Distribution of Structural Stages within Forested PVGs

Structural Stages	**Cold Forest**	**Dry Forest**
Stand Initiation (si)	18%	19%
Stem Exclusion Closed Canopy (secc)	5%	5%
Stem Exclusion Open Canopy (seoc)	4%	4%
Understory Reinitiation (ur)	38%	18%
Young Forest Multi – Story (yfm)	12%	11%
Old Multi Story (ofm)	22%	29%
Old Single Story (ofs)	1%	15%

B. Structural Stage for Cold Forest Potential Vegetation Groups-Stepdown Columbia River Basin:

In the Cold Forest ecosystems (PVG), 1991 data shows forest vegetative structural stages (SS) combinations as follows: 9% in ofs, 9 % in ofm, 47 % in a mixture of seo, sec, ur, and/or yfm, and 35% in si (Hann et al. 1997, pg 485).

Central Idaho (ERU 13) **Cold Forest PVG**: In the Cold Forest ecosystems (PVG), 1991 data shows forest vegetative structural stages (SS) combinations as follows: 14% in ofs, 12 % in ofm, 34 % in a mixture of seo, sec, ur, and/or yfm, and 39% in si (Hann et al. 1997, pg 570).

Middle Panther Creek Area Cold Forest PVG: The current structural stages are displayed in Table 12. Several structural stages predispose a high crown fire risk. The ofm averaged around 5-25% in the historical Middle Panther Creek Area landscape. In the current Middle Panther Creek Area landscape the ofm occupies 22% of the cold forest type. The ur and other mid-seral SS averaged around 20-40% in the historical Middle Panther Creek landscape. In the current ur and other mid-seral SS are at 59% in the Middle Panther Creek landscape and the ur alone occupies 38% of the cold forest type.

Several structural stages are fuel breaks regarding crown fires. The si averaged around 15-30% in the historical Middle Panther Creek Area landscape. In the current Middle Panther Creek landscape the si occupies only 17% of the cold forest type. The ofs averaged around 10% in the historical Middle Panther Creek Area landscape.
In the current Middle Panther Creek Area landscape the ofs occupies 1% of the cold forest type. These forest structures of low susceptibility to crown fires have been replaced with areas of high susceptibility or areas expected to have high fire severity (lethal damage to trees).

These changes in forest structure have increased the area in which ladder fuels may promote crown fires. The two forest structures that contain the most ladder fuels and increase the risk of crown fire are ofms and ur. Combined, they make up 60% of the cold forest PVG in the Middle Panther Creek landscape. The majority of the high risk crown fire area is located on the east side of Panther Creek.

Burn Severity and Clear Creek Fire Behavior:

Vegetation burn severity is one method used to address fire behavior. The Salmon-Challis National Forest, in cooperation with the Earth Resource Observation System Data Center, Department of the Interior (EROS Data Center, South Dakota), has been using Landsat Satellite imagery in a process called differenced normalized burn ratio (dNBR), sometimes refered to as NDBR or NBR (Key and Benson 2003), to map the burn severity for many of its fires. This process classifies the area within a fire perimeter into different levels of burn severity as displayed in Table 13 and Map 12.

Table 13 Fire Severity (Burn Severity) Classes

Severity Class Name	Class Number	Percent Replacement of Overstory Vegetation	Comments
Unburned	NDBR* Class 1	None	Not burned
Low severity	NDBR Class 2	0 to 24%	Lowest class for heat damage by fire
Mixed severity	NDBR Class 3	25 to 74%	Moderate class for heat damage by fire
Lethal severity (lethal surface)	NDBR Class 4	75 to 100% (tree crowns not consumed by fire)	High class for heat damaged by fire
Lethal severity (Crown fire)	NDBR Class 5	75 to 100% (crowns consumed by fire)	Highest class for heat damaged by fire

* NDBR is used interchangeably with dNBR.

This process of classifying burn severity allows the Forest to map and tabulate the post-fire burn severity of fires. This burn severity information was used to analyze the Clear Creek wildfire (Bennett 2006b and Bennett 2006c). The use of Landsat imagery and the dNBR process has proven to be especially useful for mapping higher burn severity levels (Wirth et al. 1996; van Wagtendonk et al. 2004; Bobbe et al. 2001; Cocke et al. 2005; Epting et al. 2005). The process has its highest accuracy detecting the higher levels of burn severity within the fire perimeter, and it is less accurate at detecting unburned/low burn severity. Therefore, this analysis focuses on trends for the higher burn severity detections, which are the strongest capabilities of the process. The analysis information has been especially useful in identifying trends related to high severity fire behavior and pre-burn fuel conditions (forest structural stage).

Clear Creek wildfire burn severity

The Clear Creek Fire was approximately 160,000 acres in size and burned over roughly 50 % of the watershed analysis area. The data from the Clear Creek Fire analysis shows that 51% of the forested ecosystems incurred a lethal fire severity (crown fire (27%) and lethal surface (24%)), 18% a mixed severity, 21% a low severity, and 10% unburned, Map 5 and 12.

Forest Structural Stage and Crown Fire Behavior

Analysis of the Clear Creek wildfire of 2000 showed that crown fire behavior can be correlated with forest structural stage. Specifically, forest stands with a closed canopy overstory and multiple tree layers (stories) have the greatest propbability of sustaining crown fire. Stands with multiple tree layers (stories) provide a ladder to allow surface fire to climb into the overstory, and the close spacing of the overstory branches allows the fire to spread from one tree to another, sometimes independent of the surface fire activity.

The forested areas within the fuels analysis area are classified into six structural stages; those structural stages are split out into four forest canopy fuel profiles. The se structural stage is classified as a closed canopy single story fuel profile. ofm, yfm, and ui structural stages are classified as a closed canopy multistory fuel profile. ofs is classifed as an open canopy single story fuel profile. The si strutural stage is classified as a stand initation fuel profile, and, due to the short height of the young trees in this fuel profile, it is not considered to be high risk for fire suppression due to crown fire.

The burn severity data for the Clear Creek wildfire clearly display the correlation between the occurrence of crown fire and the forest structure stage/fuel profile. The closed canopy multistory fuel profile accounted for ninety-two percent of the area burned by crown fire in the Clear Creek Fire (Map 5). For the forested portions of the Salmon-Cobalt Ranger District, the potential amount of crown fire area during a drought fire season is proportional to the amount of closed canopy multistory fuel profile stands in a given landscape.

Characterizing Wildfire Burn Severity Near Riparian Areas: The relationship of wildfire burn severity and riparian areas is an important one, so a detailed study of the burn severity within 300 linear feet from stream channels was conducted for the dry forested ecosystems of Clear Creek Fire of 2000 (Bennett 2006a). High or lethal burn severity near riparian areas can be a point of concern for resource managers, so the analysis focused on lethal and mixed severity impacts. Three of the Salmon-Challis National Forest's primary dry forest ecosystems include dry Douglas-fir without ponderosa pine (PVT 52), dry Douglas-fir with ponderosa pine (PVT 53), and Douglas-fir/lodgepole pine – gentle slope (PVT 74). As depicted in Tables 14, 15, and 16 below, the percent of lethal burn severity from the wildfire for upland portions of the ecosystems and areas within 300 feet of stream channels were very similar.

Table 14 Burn Severity for Dry Douglas-fir Without Ponderosa Pine (PVT 52): Percent Ecosystem Area within the Burn Severity Class

PVT 52	Lethal severity (Crown fire)	Lethal severity (lethal surface)	Combined lethal severity **	Mixed lethal
Within 300 feet of stream	25%	26%	51%	19%
Upland areas*	26%	26%	52%	18%

* Upland areas include the entire portion of the landscape for that PVT, including the areas within 300 feet of streams.
** Combined lethal severity equals Crown Fire plus Lethal Surface Fire.

Table 15 Burn Severity for Dry Douglas-fir With Ponderosa Pine (PVT 53): Percent Ecosystem Area within the Burn Severity Class

PVT 53	Lethal severity (Crown fire)	Lethal severity (lethal surface)	Combined lethal severity **	Mixed lethal
Within 300 feet of stream	18%	31%	49%	23%
Upland areas*	15%	31%	46%	24%

* Upland areas include the entire portion of the landscape for that PVT, including the areas within 300 feet of streams.
** Combined lethal severity equals Crown Fire plus Lethal Surface Fire.

Table 16 Burn Severity for Douglas-fir/Lodgepole Pine – Gentle Slope (PVT 74): Percent Ecosystem Area within the Burn Severity Class

PVT 74	Lethal severity (Crown fire)	Lethal severity (lethal surface)	Combined lethal severity **	Mixed lethal
Within 300 feet of stream	13%	20%	33%	21%
Upland areas*	17%	21%	38%	19%

* Upland areas include the entire portion of the landscape for that PVT, including the areas within 300 feet of streams.
** Combined lethal severity equals Crown Fire plus Lethal Surface Fire.

Current Conditions -- Fish Populations

The Middle Panther Creek Watershed supports populations of Federally-threatened, Forest Service-sensitive, and Salmon-Challis National Forest management indicator species, as well as one introduced non-native salmonid and a variety of native non-salmonid fish.

Federally threatened-adult Chinook salmon utilize spawning habitats within mainstem Panther Creek, while juvenile Chinook salmon have been observed rearing in Panther Creek, as well as in lower Blackbird and Big Deer creeks (Kuzis 2004). Federally-threatened Steelhead/rainbow trout juveniles have been found in Deep, Little Deer, Big Deer, South Fork Big Deer, and lower Blackbird creeks. Federally-threatened bull trout, also a Salmon-Challis National Forest Management Indicator Species, are known to occur in Deep and Panther creeks, and have recently been observed in lower Blackbird Creek (Beak and Golder, 2002).

Westslope cutthroat trout, a Forest Service Intermountain Region Sensitive Species, is found in Deep, Panther and Big Deer creeks. Non-native brook trout are found in upper reaches of Panther Creek and Little Deer Creek. Mountain whitefish have been observed in Panther and Blackbird creeks.

Among native non-salmonid fish, Dace, Northern pikeminnow, and redside shiners were found in mainstem Panther Creek, while sculpins were found in Panther, Deep and Blackbird creeks (Kuzis 2004). Brook trout inhabit the lower reaches of Little Deer Creek and Deep Creek along with main Panther Creek. Their densities appear to be very low within the Middle Panther Creek Watershed.

Current species distributions and population status of federally listed and Forest Service Sensitive species within each of the Middle Panther Creek Watershed's six subwatersheds are summarized in Fisheries Appendix A.

Gebhards (1959, in Thurow and Overton, 1993) reported the existence of two separate Chinook salmon runs in the Panther Creek drainage. One group of fish spawns in mid-August in the mainstem Panther Creek waters within the Upper and Middle Panther Creek Watersheds. A second group spawns in reaches within the Middle and Lower Panther Creek watersheds below Napias Creek after water temperatures begin their annual September decline. Corley (1967, in Thurow and Overton, 1993) estimated that as many as 2,000 salmon may have spawned annually in the drainage. Due to impacts discussed below, however, Chinook salmon spawning within the Middle Panther Creek Watershed has occurred only infrequently during the past 60 years.

Since the late 1970's, the Idaho Department of Fish and Game has attempted to re-establish runs of Chinook salmon and steelhead in Panther Creek by introducing fry, smolts and adults (IDFG, 1977-1989, in Thurow and Overton, 1993; IDFG, 2008a). Spring Chinook fry were stocked in 1977. In 1986 and 2001, adult Chinook salmon, that were surplus to hatchery needs, were released in Panther Creek. An added objective of these releases was to provide harvest opportunity for sport anglers and the Shoshone-

Bannock tribal fishery. Steelhead fry were stocked in 1977-78, 1982, 1984-87 and 1989. Steelhead smolts were stocked in the late 1970's and throughout the 1980s, and adults were released in the mid to late 1980's. In 1987, fertilized Chinook salmon eggs were also buried in Panther Creek.

Annual spawning surveys conducted by the Idaho Department of Fish and Game between 1986 and 2000 did not identify any adult Chinook salmon or spawning activity in the Panther Creek drainage during that period. Utilization of the drainage has increased throughout the 2000's with spawning adult Chinook being observed in 2001, 2002, 2004, 2005, 2006, 2007 and 2008 (IDFG, 2008b).

Fish Habitat

Properly functioning condition, or PFC, is the sustained presence of natural habitat-forming processes in a watershed (e.g., riparian community succession, bedload transport, precipitation runoff patterns, channel migration, etc.) that are necessary for the long-term survival of fish through the full range of environmental variation (NMFS 1996). A Matrix of Pathways and Indicators summarizing the current functional condition of habitat elements within the Middle Panther Creek Watershed is included as Fisheries Appendix B of this document. The following narratives summarize the functionality determinations of the aquatic habitat pathways and indicators addressed in the Matrix, along with causal elements responsible for the classification.

Water Quality

Temperature: Woodtick Creek, Deep Creek and Big Deer Creek are the only streams within the Middle Panther Creek Watershed determined to be consistently Functioning Appropriately relative to PACFISH and INFISH water temperature criteria. Mainstem Panther Creek reaches within the watershed, along with Blackbird Creek, are considered to be Functioning at Risk relative to water temperatures, with the remaining streams in the watershed being classed as Functioning at Unacceptable Risk

Sediment: Deep Creek, Woodtick Creek and Little Deer Creek are currently Functioning Appropriately with respect to sediment conditions. Big Deer Creek has been Functioning at Risk, with improvement in recent years. Blackbird Creek and Little Deep Creek are considered to be Functioning at Unacceptable Risk. The Middle Panther Creek Watershed consists predominately of Quartzites. Volcanic and granitic geologies located upstream probably have the greatest influence on sediment levels in main Panther Creek. Although there are no sediment monitoring sites along main Panther Creek in the Middle Panther Creek Watershed, observed sediment levels in adjacent upstream and downstream watersheds are considered to be Functioning at Risk.

Blackbird Creek is listed as a *303d* Water Quality Limited Segment due to elevated sediment levels.

Chemical Contaminants/Nutrients: Deep Creek, Woodtick Creek and Little Deer Creek are considered to be Functioning Appropriately with respect to chemical constituents and nutrients. Blackbird Creek, lower Big Deer Creek and Panther Creek from Blackbird Creek downstream to the Salmon River are Functioning at Unacceptable

Risk, and are listed as *303d* Water Quality Limited Segments due to chemical contaminants (acid rock drainage from the Blackbird Mine). Since the initiation of clean-up efforts at Blackbird Mine, substantial progress has been made in meeting required water quality standards, and salmonid fish are beginning to reoccupy lower Blackbird Creek and Big Deer Creek downstream of the South Fork of Big Deer Creek. Although fish populations have increased along main Panther Creek, populations still appear to be depressed.

Baseline water chemistry monitoring conducted by the Forest Service indicates that DO & pH meet State water quality standards in all streams within the watershed.

Habitat Access

Physical Barriers: While Deep Creek is considered to be Functioning Appropriately, the remainder of the Middle Panther Creek Watershed is considered to be Functioning at Risk with respect to habitat access. While there are no physical-migration barriers along Panther Creek in the Middle Panther Creek Watershed, for many years water quality problems below Blackbird Creek and Big Deer Creek essentially blocked migration up and down Panther Creek. As described above, however, this situation is improving, and adult Chinook salmon have been observed spawning within the watershed in 2001, 2002, 2004, 2005, 2006, 2007 and 2008.

There is a natural cascade located approximately three-eights of a mile up Big Deer Creek that blocks migration of bull trout, steelhead trout, and Chinook salmon. As described above, water quality problems from the South Fork of Big Deer Creek have essentially blocked the migration of these three species into lower Big Deer Creek.

The lower quarter-mile of West Fork of Blackbird Creek has been placed into an artificial concrete channel across the tailings impoundment. At the lower end, this concrete channel plunges approximately 60-70 feet. This channel is both an upstream and downstream barrier to all fish species.

Sections of main Blackbird Creek downstream of Meadow Creek have also been placed in a concrete channel to prevent leaching through the waste rock piles. There is also a small dam and reservoir located along main Blackbird Creek just upstream from Meadow Creek. Both of these man-made features are upstream barriers to fish passage.

A culvert on Deep Creek considered to be a passage barrier to upstream migrating fish was replaced with a passable open bottomed structure in the late summer of 2008. Removal of an impassible culvert within the Woodtick drainage has not yet occurred nor is it planned.

None of the water diversions in the Middle Panther Creek Watershed are known to be fish passage barriers

Habitat Elements

Large Woody Debris: Woodtick Creek is Functioning Appropriately with respect to large woody debris (LWD). Large woody debris functionality is variable within Little Deer Creek, with functional and nonfunctional reaches dependent upon areas impacted by the Clear Creek fire. The remainder of the watershed is considered to be Functioning at

Risk. Large woody debris exceeds Natural Condition Database indices in seven of 18 reaches surveyed by Forest fisheries crews. Since these surveys were performed, the middle reaches of main Panther Creek, the lower five miles of Big Deer Creek, and most of Blackbird Creek and the West Fork of Blackbird Creek experienced stand-replacing fire during the Clear Creek Fire of 2000. Large woody debris levels in these reaches have increased substantially since that time, and are expected to continue to increase in future years as the fire-killed trees continue to fall.

Pool Frequency & Quality: Woodtick Creek and Big Deer Creek are Functioning Appropriately with respect to pool frequency and quality. Mainstem Panther Creek and Deep Creek are considered to be Functioning at Risk, and Blackbird Creek and Little Deer Creek are considered to be Functioning at Unacceptable Risk. Five of 18 reaches surveyed by Forest fisheries crews meet Natural Condition Database indices for pool frequency. Although lower Big Deer Creek is poor habitat from the standpoint of water quality, both pool quantity and quality along this reach of Big Deer Creek above the cascades are good. Because of road encroachment and lack of LWD along main Panther Creek, pools are lacking, and aquatic habitat along the stream is dominated by riffles and pocket water habitat.

Off-channel Habitat: Woodtick Creek and Big Deer Creek are Functioning Appropriately with respect to off-channel habitat. Little Deer Creek is Functioning at Unacceptable Risk, and the remainder of the watershed is considered to be Functioning at Risk. Because main Panther Creek is a confined channel in a deep canyon, side-channel and backwater habitat is naturally low. Road encroachment and stream channeling on private land have also caused further reductions along main Panther Creek. Only 1.6 percent of the habitat along main Panther Creek below Blackbird Creek and 0 percent above Blackbird Creek consist of off-channel habitat. This compares to 7 percent along Woodtick Creek and 2 percent along Deep Creek. Backwater and side-channel habitat appears to be plentiful along Big Deer Creek above the cascades.

Refugia: All streams of the Middle Panther Creek Watershed are considered to be Functioning at Risk with regard to refugia. Because of man-made barriers (i.e., concrete channel, dams, culverts, and pollution) and natural barriers (i.e., cascades and falls), fish that occupy main Panther Creek in the Middle Panther Creek Watershed have limited refugia opportunities. Deep Creek, lower Napias Creek, and main Panther Creek and tributaries above Blackbird Creek provide refugia from warmer water temperatures and pollution when needed.

Channel Condition and Dynamics:

Width/Depth Ratio: Deep Creek, Woodtick Creek, Big Deer Creek and Panther Creek above Blackbird Creek are all considered Functioning Appropriately with respect to width/depth ratios. No surveyed reaches along main Panther Creek from Big Deer Creek to Blackbird Creek meet Natural Condition Database indices for width/depth ratio, and this reach of Panther Creek, along with Blackbird Creek, is considered to be Functioning at Risk. Standing dead trees between the road and the creek have been cut for firewood or removed as hazard trees, resulting in fewer pools along this reach. It appears the same is true for Blackbird Creek. Although lower Big Deer Creek is poor habitat from the standpoint of water quality, the stream's width/depth ratio appears to meet Natural

Condition Database indices above the cascades. Kuzis (2004) found that no sites within Little Deer Creek were meeting width/depth criteria and identified the stream as Functioning at Unacceptable Risk.

Streambank Condition: Panther Creek above Blackbird Creek is considered to be Functioning at Risk with respect to streambank condition, and Blackbird Creek is considered to be Functioning at Unacceptable Risk. The remainder of the watershed is considered to be Functioning Appropriately. Overall, streambanks along Big Deer Creek appear to be in good condition, although some transient disturbances have been observed at the mouth of the stream. Bank stability conditions in Little Deer Creek have improved in recent years after being significantly impacted by the Clear Creek Fire. Streambank conditions along Blackbird Creek are extremely unstable following years of mining and mine clean-up activities. Most areas adjacent to the Blackbird Creek stream channel are absent of deep-rooted riparian species that hold stream banks together.

Floodplain Connectivity: The Panther Creek and Blackbird Creek roads encroach on their respective streams for most of their length. Neither stream can access their floodplains along certain reaches.

Flow/Hydrology:

Change in Peak/Base Flows: Woodtick Creek and Big Deer Creek are Functioning Appropriately with respect to off-channel habitat, while all other subwatersheds are considered to be Functioning at Risk. Data from the watershed prior to the Clear Creek Fire of 2000 show flow regimes similar to the projected hydrograph. Several drainages of the watershed, and in some cases entire subwatersheds, experienced stand replacing fire. The drainages most impacted by the Clear Creek Fire of 2000 were Little Deer Creek, Cliff Creek, Blackbird Creek, the West Fork of Blackbird Creek, and several smaller intermittent and perennial drainages in the Big Deer Creek subwatershed. The hydrograph may change as a result because of the high canopy removal.

A total of 1.3 cfs can be diverted under 25 water right claims scattered throughout the Middle Panther Creek Watershed.

Increase in Drainage Networks: There has been none to minimal increase in active channel lengths correlated with human caused disturbances within the watershed.

Watershed Conditions:

Road Density & Location: Panther Creek, Blackbird Creek , Copper Creek and Bucktail Creek are considered to be Functioning at Unacceptable Risk with respect to road density and location, with the remainder of the streams of the watershed being considered as Functioning at Risk. The Panther Creek, Copper Creek, and Blackbird Creek roads encroach on their respective streams for most of their lengths. In addition, several old mining roads cross through the headwaters of Bucktail Creek, which drains the north side of the Blackbird Mine in the Big Deer Creek subwatershed. The Blackbird Creek subwatershed has the highest density of roads in the Panther Creek drainage.

Most other roads lie perpendicular to the streams.

Disturbance History: Because of the fires of 2000, the Risk of Cumulative Watershed Effects for the entire Middle Panther Creek was determined to be High. At the subwatershed level, Risk of Cumulative Watershed Effects range from Low in the Woodtick Creek sub-watershed, Moderate in the Panther Fawn Subwatershed, Moderately to High in the Deep Creek Subwatershed, to High in the Panther-Copper, Blackbird Creek, Panther-Little Deer, and Big Deer subwatersheds.

Riparian Conservation Areas: With extensive disturbance of its channel and riparian corridor and a road paralleling long reaches of its length, Blackbird Creek is Functioning at Unacceptable Risk relative to Riparian Conservation Areas. Little Deep Creek, Copper Creek, Panther Creek and Little Deer Creek are Functioning at Risk, with the remainder of the watershed's streams considered to be Functioning Appropriately. Most of the grazing in the watershed occurs adjacent to higher gradient streams in steep canyons. The Williams Basin-Napias Allotment lies in the Deep, Woodtick, Panther–Copper, Panther–Fawn, and Panther–Little Deer subwatersheds east of Panther Creek. The Deer–Iron Allotment connects with the top of the Woodtick Creek subwatershed. On rare occasions, cattle from the Williams Basin–Napias Allotment graze along main Panther Creek. Most of the grazing along perennial fish-bearing streams occurs along upper Deep Creek, Little Deep Creek, and upper Copper Creek. Grazing has adversely affected short segments of upper Spring Creek and Copper Creek.

As previously described, riparian areas along Panther Creek and Blackbird Creek have been adversely affected by roads and mining activities. Riparian areas in the Big Deer Creek subwatershed are Functioning Appropriately even though the lower portion of the drainage has been impacted by acid rock drainage from Bucktail Creek.

Disturbance Regimes: The resiliency of the habitat to recover from environmental disturbances is likely reduced due to roads, historic mining activities, and the Clear Creek Fire. Scour events, debris torrents, and rain-on-snow events are rare.

Integration of Species and Habitat Conditions:

Habitat Quality & Connectivity: Between water quality problems, poor riparian conditions, and natural and man-caused barriers, Big Deer Creek, mainstem Panther Creek below Blackbird Creek, and Blackbird Creek are considered to be Functioning At Unacceptable Risk. Impacts are less in the Deep Creek, Woodtick Creek, Panther – Little Deer and Panther – Copper subwatersheds, which are classed as Functioning at Risk. Connectivity has been reduced between local populations. Habitat features such as water temperature, sediment, water quality, riparian area integrity, and large woody debris recruitment are not likely to recover in one generation. Reaches of good habitat are fragmented. The biggest threats to aquatic habitat in the Middle Panther Creek Watershed are high cobalt and copper levels from Bucktail and Blackbird creeks, lack of connectivity and habitat fragmentation, and high sediment levels from upstream mining, roads, grazing and wildfires.

Management Activities and other Factors That Have Affected Current Conditions

As identified above, historic to recent mining activity, livestock grazing, roads and wildfires have all produced significant effects on fisheries resources and aquatic habitats within the Middle Panther Creek Watershed.

Mining activities have impacted water quality, habitat access, habitat elements, and channel and watershed conditions within the Blackbird Creek, Big Deer Creek, Panther-Little Deer and Panther-Fawn watersheds, and have been largely responsible for loss of the Panther Creek drainage's historic salmon and steelhead runs.

Mining activity began in Panther Creek around 1900. According to Platts (1972), continual degradation of the aquatic habitat varied in intensity, depending on the amount and type of mining and milling activity. Parkhurst (1950) surveyed Panther Creek in 1941 and reported that Chinook salmon numbers had declined steadily relative to prior years. Gebhards (1959) similarly reported that the Chinook runs in Panther Creek began to decline in the 1940's, stating that the runs dropped sharply following the development of the Blackbird Mine.

The Chinook run continued to decline through the 1950's. In March, April and July of 1954, release of acid effluent from the Blackbird Mine resulted in direct mortality of steelhead, Chinook salmon, trout and whitefish in Panther Creek (Corley, 1967). An estimated 200 Chinook salmon were killed in the 1954 spills. Between 1954 and 1967 there were numerous reports of black sediments in Blackbird Creek and Panther Creek (Corley, 1967). In 1957 Panther Creek was closed to salmon fishing in an effort to sustain the dwindling runs (Gebhards, 1959). By the 1960s, with additional depletion of Idaho's anadromous fish runs due to the large hydroelectric dams on the Columbia and Snake Rivers, Chinook salmon utilization of the Panther Creek drainage was essentially non-existent.

Livestock grazing has impacted water quality, habitat elements and watershed condition pathway elements within the Deep Creek, Panther-Copper, Panther-Fawn and Panther-Little Deer subwatersheds.

Roads constructed along Panther Creek, Blackbird Creek, Copper Creek and Deep Creek have impacted water quality, habitat elements and watershed condition pathway elements within the Panther-Copper, Panther-Fawn, Blackbird Creek and Deep Creek subwatersheds. Stream crossings within the Woodtick Creek Subwatershed have impacted habitat access.

Wildfire within the watershed, most notably the Clear Creek Fire of 2000, has impacted water quality, habitat elements, channel condition, flow/hydrology and watershed condition pathway elements within the Blackbird Creek, Big Deer Creek, Little Deer Creek, Panther-Copper, Panther-Fawn and Panther-Little Deer Creek subwatersheds.

Fisheries and Aquatic Habitat Enhancement Activities
Since the late 1970's, the Idaho Department of Fish and Game has attempted to re-establish runs of Chinook salmon and steelhead in Panther Creek by introducing fry, smolts and adults (IDFG, 1977-1989). Spring Chinook fry were stocked in 1977. In 1986, 3,384 adult Chinook salmon that were surplus to the Pahsimeroi Hatchery were released in Panther Creek (McArthur, 1988). An added objective of the release was to provide harvest opportunity for sport anglers and the Shoshone-Bannock and Nez Perce tribal fisheries.

Steelhead fry were stocked in the study area in 1977-78, 1982, 1984-87 and 1989. Steelhead smolts were stocked from 1983-1988 and adults were released in 1985-86. In 1987, fertilized Chinook salmon eggs were also buried in Panther Creek.

In addition to cleanup operations being conducted by the Blackbird Mine Site Group (see Hydrology discussion), the Salmon-Challis National Forest has been working over the past 27 years to improve aquatic habitat conditions within the Panther Creek drainage by constructing in-stream structures, stabilizing eroding road slopes, and correcting migration barriers in the Panther Creek drainage (Table 17).

Table 17: Fish Habitat and Watershed Improvement Projects

SUBWATERSHED	YEAR	Description
Panther–Copper	1981	Boulder/rock placement along Panther Cr above Blackbird Cr to improve instream cover
	1983 1988 1989	Boulder/rock placement along Panther Cr above Copper Cr to improve instream cover and road stabilization
	1984	Boulder/rock placement along Panther Cr below Moyer Cr to improve instream cover
	1990	Rock placement, bank stabilization, and road cutbank reclamation along Panther Creek between Blackbird and Musgrove creeks to improve instream habitat and mitigate road-related impacts
Deep Creek	2001	Little Deep Cr drift fence
Deep Creek	2008	Replace Deep Creek culvert with fish-passable open bottom arch culvert

Current Conditions -- Terrestrial Species and Habitats, Current Habitat Conditions and Descriptions

The wide elevation range with its accompanying climatic variations, full spectrum of vegetative communities and rugged topography, results in a diverse array of habitats and niches for many species of flora and fauna. Predominant habitat types vary from sagebrush/grasslands, Douglas-fir/Idaho fescue and Douglas-fir/ninebark or snowberry at lower and mid-elevations to subalpine fir/grouse whortleberry, whitebark pine, and alpine habitat types at higher elevations. Fire, especially the extensive Clear Cr wildfire of 2000, has altered the landscape and created brush fields, large lodgepole pine stands, extensive snag patches, and variations of all vegetative age classes within each of these habitat types. From the lowest elevations to the highest, respectively, habitat types and

phases within the following vegetative series are well represented: sagebrush/grasslands, Douglas-fir, subalpine fir, Engelmann spruce, whitebark pine and alpine (Map 8). A variety of riparian community types occur at all elevations. Each of these series and other habitat important for wildlife will be briefly addressed.

Habitat types within the **sagebrush/grassland** series generally occur on mid-elevation south slopes and throughout the lower elevations. These habitat types, which occupy approximately 4,971 acres within the analysis area, are dominated by bluebunch wheatgrass and Idaho fescue communities and/or by mixed sagebrush/bunchgrass communities. These communities are also found at higher elevations in the Douglas-fir series, on favorable southerly aspects, where they occur as dry upland openings which are often included in a mountain grassland habitat type. Scattered stands of mountain mahogany/bluebunch wheatgrass occur within areas dominated by this series, especially on extremely rocky, harsh, southerly-exposed slopes at lower elevations. Elk and mule deer utilize these habitats extensively during winter and early spring; however, some native ungulate use occurs during all seasons. Species likely to be found associated with these habitat types include gray wolf, greater sage-grouse, vesper sparrow, Brewer's sparrow and lemhi penstemon. The native bunchgrass communities within this series are susceptible to invasion by noxious weeds such as spotted knapweed, rush skeletonweed and other exotics such as cheatgrass. Although many of these weed occurrences are mostly on travelways such as roads and trails, the opportunity for spread within established grasslands is of concern.

The **Douglas-fir series** occupies the broadest range of environmental conditions of any conifer-dominated vegetative communities within the Middle Panther Creek watershed. Habitat types common within this series range from savannah-like stands of Douglas-fir/bluebunch wheatgrass, Douglas-fir/Idaho fescue and Douglas-fir/heartleaf arnica to very dense mixed stands of Douglas-fir and lodgepole pine in the Douglas-fir/ninebark habitat type. Lodgepole pine is a common seral species in many of the habitat types within this series (Steele, et.al. 1981). Large essentially pure stands of Douglas-fir are present in the watershed. This series occupies approximately 73,740 acres (Table C) in the analysis area and is especially prevalent in the mid-elevations as a mid-slope band throughout the entire watershed. Some extensions to higher elevations are common.

The large area dominated by Douglas-fir and the extremely diverse array of wildlife habitats offered by the various vegetative communities within these habitat types makes this series extremely important to many indigenous species of wildlife ranging from wild ungulates to neotropical migratory songbirds. Mule deer and elk make extensive use of this series for winter thermal cover at the lower elevations, summer thermal cover at mid- to higher elevations and hiding cover on both summer and winter ranges. It also supplies forested forage areas all year and extremely important birthing/rearing areas, especially along ecotones where Douglas-fir habitats abut nonforested sagebrush/grass habitats. Perennial grasses and forbs in the Douglas-fir communities provide extremely important winter forage for elk and potentially mule deer if sagebrush, bitterbrush or mountain mahogany are present. All native ungulates and black bear forage extensively in all of these types, except Douglas-fir/pinegrass, in early spring. Mule deer and elk use the

Douglas-fir/ninebark communities for year-round cover and for birthing and rearing areas. Douglas-fir communities provide vital habitat for a diverse array of small mammals and birds ranging from pine marten to raptors, western tanagers and blue grouse. Blue grouse depend on the large old Douglas-fir trees, especially along ridgetops, for winter forage and shelter. Additional species associated with this series include fisher, ruby-crowned kinglet, pileated woodpecker, flammulated owl, great gray owl, western big-eared bat and northern goshawk.

The **subalpine fir** series contains several different habitat types and collectively occupies an estimated 35,772 acres within the watershed. The most common types within this series include subalpine fir/heartleaf arnica, subalpine fir/common juniper and subalpine fir/grouse whortleberry. Douglas-fir, lodgepole pine and Engelmann spruce are important seral species in all of these habitat types. Large stands of lodgepole pine are perpetuated in this series through stand-replacing wildfires. Upper elevation sites within this series often attain climax conditions and remain in subalpine fir stands for long periods. These stands often grade into whitebark pine at the upper elevational limit of this series, as occurs on Lake Mountain and in the vicinity of Moyer Peak and along portions of Gant Ridge. The large, relatively unbroken forested expanses within this series occur primarily at mid-slope to upper slope, and provide extremely important cover blocks and key summer ranges for elk, moose, black bear and mule deer.

Subalpine fir/bluejoint and subalpine fir/grouse whortleberry habitat types offer forested forage areas as well as summer hiding and thermal cover for big game. Elk and moose make wallows in the wet seeps that are common in the upper elevations of these types and seral states, particularly in the subalpine fir/bluejoint type which often provides abundant forage in the form of willows and sedges. All types within this series provide key rutting or breeding areas for elk and moose. Blue grouse and spruce grouse use this series extensively for summer forage and nesting. Habitat types such as subalpine fir/heartleaf arnica are essentially lacking of big game forage and are only used for cover. Stand-replacing wildfire mosaics provide important foraging areas within this series until canopy closure of regenerating lodgepole pine stands occur.

Species known to use subalpine fir habitats include spruce grouse, great gray owl, boreal owl, fisher, Canada lynx and especially three-toed woodpeckers in burned areas. Much of the watershed west of Panther Creek mapped as lynx habitat burned during the Clear Creek wildfire of 2000. The fire produced habitat conditions that are identified as unsuitable for lynx which largely consist of early successional stages incapable of supporting snowshoe hares (Ruediger et al. 2000). Coniferous vegetation and deciduous shrub species within the Lynx Analysis Units have not yet regenerated to the level required to provide quality forage and cover for hares (lynx primary food) during winter (US Forest Service 1999). Current recommendations for forest management activities will follow direction provided in the Record of Decision for the Final Environmental Impact Statement for the Northern Rockies Lynx Management Direction (US Forest Service 2007).

The **Engelmann spruce** series is poorly represented and occurs as incidental habitat types within the watershed. Three habitat types within this series that occur are: Engelmann spruce/sweet scented bedstraw, Engelmann spruce/soft leaved sedge and Engelmann spruce/common horsetail. Engelmann spruce stands are usually found on moist, cool slopes associated with seeps, especially on higher elevation north slopes, and along streams such as those found in the head of Big Deer Creek. Though present in limited amounts, these moist, cool sites provide important summer thermal cover and bedding areas for deer, elk, moose, and black bear. In addition, these sites are generally heavily used by bull elk during summer and fall as wallow/rutting areas. Dense spruce stands along streams also provide important denning habitat for Canada lynx and nesting habitat for birds such as boreal owl and hermit thrush.

The **whitebark pine** series occupies 309 acres and constitutes the very uppermost timberline in a few sites within the assessment area. Habitat types within this series have not been extensively studied but probably include whitebark pine/grouse whortleberry, whitebark pine/elk sedge and whitebark pine/Idaho fescue (Steele, et al. 1981). These types generally occupy dry exposed ridgetops and often extend downslope where they merge with subalpine fir communities. Productivity is low and regeneration of such stands is slow to occur after disturbances. Whitebark pine stands provide important summer/early fall habitat for mule deer, mountain goats and elk. High summer and fall forage values are present, especially where elk sedge or Idaho fescue occurs. These stands are used extensively as summer bedding areas to escape heat and insects. Key wintering areas for mountain goats often occur in these habitat types. During fall months, these communities are used extensively by blue grouse. Whitebark pine nuts provide an important late-fall food source for black bear just prior to denning. An important species found in these communities is the Clark's nutcracker which is largely responsible for perpetuation of whitebark pine stands via seed caches.

Non-forested alpine plant communities have not been systematically described in central Idaho, including the assessment area. Although alpine grass/forb and shrub communities occupy a small part of the watershed, these plant associations are very important to many species of wildlife. These low-production communities are dominated by shrubs such as mountain heathers and Labrador tea, grasses such as wheatgrasses, fescues, alpine timothy and various sedges, rushes and forbs, especially in the small wet areas that occur downslope from semi-permanent snowbanks. Alpine habitat types are used extensively by mountain goats during summer months and, to a lesser degree, by summering elk and mule deer. These sites constitute very important denning and foraging habitat for pika, marmots and wolverine when interspersed with rock outcrops, talus and scree slopes. Bird species commonly found in alpine habitats during nesting season include water pipits and rosy finches.

Riparian community types that occur within the watershed include those dominated by coniferous trees, deciduous trees, shrubs and herbaceous vegetation (Youngblood, et al. 1985). Riparian areas within all types provide key wildlife habitats for many different species ranging from nesting neotropical migratory songbirds to moose and elk cow/calf summering bands. These community types provide the important element of structural

diversity, especially when interspersed within large areas dominated by habitat types such as lodgepole pine/grouse whortleberry or Douglas-fir/pinegrass, thus greatly increasing available niches for many species.

Although riparian areas occupy only 477 acres of the watershed, the ecological importance of such areas cannot be overstated. At mid- to high elevation, Engelmann spruce and subalpine fir tend to dominate these riparian communities. These habitat types provide nesting and foraging habitats for birds such as mountain chickadee, ruby-crowned kinglet, yellow-rumped warbler and pine siskin. Bull moose and bull elk use these areas extensively during late summer and early fall. Pine marten find excellent foraging and denning sites in these types during all seasons. At lower elevations, these communities often contain aspen and/or cottonwood as co-dominants (Padgett et al. 1989). These species along with dense shrub layers consisting of species such as willow and red osier dogwood, provide even greater habitat diversity for small birds, mammals and their predators including peregrine falcon, great gray owl and northern goshawk.

In addition, browse provided by such shrubs is often critically important to wintering elk, moose, and deer during periods of deep snow and extremely cold temperatures. At mid- to lower elevations, lodgepole pine and Douglas-fir may also occur in riparian communities. Wildlife uses of these communities are similar but species shifts occur in the bird and small mammals inhabiting them. Beaver are found in these riparian communities and some shrub-dominated types. Neotropical migrants such as yellow warblers utilize the lower elevation communities where cottonwoods dominate. Harlequin duck may use the high water levels and larger boulder substrate in early spring during migration through Panther Creek.

In this assessment area, the most extensive riparian areas occur along portions of Panther Creek and Big Deer Creek. Several areas along Panther Creek are in private ownership and have been influenced by this development. Both willow and other shrub-dominated riparian communities occur at all elevations in the watershed. These types provide extremely important vertical structural diversity and thus a broad array of habitats for many avian species such as yellow warbler and small mammals such as snowshoe hare and mink. Browse for big game species such as elk, mule deer, moose and white-tailed deer is abundant in these shrub communities and the dense thickets are also commonly used by these species for rearing young.

Small riparian communities dominated by herbaceous plants including grasses, forbs and sedges such as those at high elevation lakes, occur throughout the watershed. These communities represent a broad environmental spectrum ranging from small ponds or perennially saturated sites to sites that are only wet seasonally (Padgett, et al. 1989). Wildlife uses range from seasonally important habitat components providing lush forage for lactating cow elk to season-long habitats for amphibians including Columbia spotted frog and long-toed salamander. Birds such as great blue heron, common snipe, and song sparrow use these areas for foraging and/or nesting.

Snags and down, woody debris habitat is found throughout the assessment area wherever a tree or shrub overstory occurs. Snag habitat is required by many species including pileated woodpecker and three-toed woodpecker and other cavity nesting bird species which depend on woodpecker excavations as a source of cavities for nesting. These secondary or obligate cavity nesters such as boreal owl, flammulated owl and mountain bluebird, as well as a variety of other species such as bats and pine marten, use natural or excavated cavities for denning or as cover. Broken topped snags are preferred by great gray owl.

Insect and disease activity and low to moderate intensity fires create snag habitat. The most important tree species for cavity-dependent species are Douglas-fir, aspen and cottonwood. Down, woody debris is an important habitat for many species such as fisher, forest grouse, pileated woodpecker, and small mammals, and provides foraging, nesting, denning and cover habitat. Trees in excess of 15 - 20 inches dbh and 10 - 15 feet or greater in length constitute optimum down, woody debris.

Logging and firewood cutting are the primary threats to quantity and quality of snag and down, woody debris habitat. Loss of snag habitat due to firewood cutting occurs mainly along open roads and accessible snags within several hundred feet of the road are usually removed sooner or later. Large diameter Douglas-fir trees above the Deep Cr road and along the Panther Cr road have been especially vulnerable in recent years. Snag removal in riparian areas represents a substantial loss for snag dependant wildlife. Severe fires such as the Clear Creek wildfire of 2000 usually consume larger fuels and can also eliminate down, woody debris, though can create snags. Numerous snags are located in the area burned by the Clear Creek Fire of 2000. The recent bark beetle epidemics in lodgepole pine and Douglas fir trees have created a supply of snags in the watershed.

Older forest habitat is found in all forest cover types in the assessment area (Map 9). This habitat is described by multi-storied stands of large, older trees (15 - 20 inches dbh and 200 years or older), a relatively dense and uneven canopy, and the presence of snags and down, woody material. Older forest conditions are recognized as vital habitat for many species which depend on its functional and structural characteristics and also for its contribution to the vegetative diversity and mosaic pattern on the landscape. The total amount of older forest habitat in the assessment area at present is based on the amount of forest in Structural Classes 6 (multi-strata old forest) and 7 (single stratum old forest) for an approximate total of 30,000 acres. Most of this occurs in the mesic Douglas-fir stands (23,625 ac), subalpine fir (6,117 ac), mixed aspen and conifer (approximately 50 ac) and high elevation whitebark pine (5 ac). Older forest Douglas-fir habitat occurs in pure stands at low to mid-elevations or intermixed with lodgepole pine, subalpine fir, and some whitebark pine at higher elevations. Subalpine fir older forest typically consists of mixed conifer stands composed of varying amounts of subalpine fir, lodgepole pine, Engelmann spruce, white bark pine and occasionally some Douglas-fir. These habitats are most often used by Canada lynx, fisher, western big-eared bat, northern goshawk, great gray owl, flammulated owl and boreal owl.

Whitebark pine stands constitute the highest elevation older forest conditions. Whitebark pine has seriously declined throughout its range due to the white pine blister rust, an introduced disease that the species has little defense for, mountain pine beetle epidemics, encroachment by subalpine fir, and fire suppression. The whitebark pine forest in the assessment area is still fairly vigorous, but is beginning to be affected by these factors.

Aspen clones are a valuable, and limited, habitat resource for a wide variety of wildlife species. Aspen patches provide foraging, resting, breeding and nesting habitat for many birds and mammals. Aspen leaves, buds and young stems are nutritious forage for wild ungulates, porcupine, beaver, ruffed grouse, cottontail rabbit, snowshoe hare and rodents. Grass and forb production in aspen patches is often much higher than surrounding areas. Aspen, with its lush understory, is attractive to elk and deer for birthing and rearing and also furnishes hiding and thermal cover for small mammals. This concentration of small mammals also provides good foraging for raptors, such as northern goshawk, as well as mid-sized and small predators such as coyote, fox and weasel. Finally, dead and dying trees provide quality snag habitat for primary and secondary cavity nesters. The amount of aspen within the assessment area has generally been underestimated due to the parameters for accurate aerial photograph interpretation which require that stands be 5 acres or larger in order to be delineated. Patches overtaken by conifers and linear clones along stream courses are likely not included in the 133 acres. These aspen stands are widely scattered throughout the watershed. Inspection of historical records and photographs, older aerial photographs, and ground verification within the assessment area suggest that there is a steady downward trend for aspen and that aspen is much less prevalent than what occurred historically. Clearing for agricultural purposes, fuelwood harvesting, over utilization by livestock, fire suppression and conifer encroachment have been identified as the primary sources of decline.

Mountain mahogany occurs in extremely minor amounts (74 acres) in the assessment area, but does constitute a very important habitat component for elk, deer and mountain goat, especially during the winter and spring months. Mountain mahogany is one of the few shrubs that meets or exceeds the winter protein requirements for wild ungulates. However, mature stands are often beyond the reach of browsing animals, especially deer and mountain goat. Heavy browsing, which removes lower secondary branches or crops the branches back to the main trunk, can also render a stand unavailable as forage. Suitable mahogany stands in the assessment area are usually heavily used to meet requirements for bedding, foraging and cover. Small, isolated stands occur on rocky slopes in Panther Creek, Deep Creek and are also interspersed within the ponderosa grassland savannah.

Rock habitats include outcrops, cliffs, spires, caves, and talus. Representative areas include glaciated areas in the headwaters of Big Deer Creek as well as the dry, grassland slopes along portions of Panther Creek. Large rock outcrops and talus slopes occur primarily at higher elevations throughout the assessment area. This habitat is limited and approximately 2,000 acres of rock features occur in the assessment area. These areas are used by peregrine falcon, golden eagle, various migratory songbirds and bat species, mountain goat, pika, bushy-tailed woodrat and wolverine. There have been few impacts

to rock features within the assessment area. Some sites have been used as borrow sources while others have been subjected to minerals exploration and small-scale mining ventures. On the whole, however, these habitats are intact and functional.

The Middle Panther Creek watershed is both large enough and diverse enough to provide yearlong habitat requirements for many indigenous wildlife species. Exceptions include species that are by nature migratory such as neotropical migratory songbirds and waterfowl. Wildlife Appendix A gives a summary of terrestrial habitats available to species of special status including threatened, endangered, sensitive, and Management Indicator Species in this watershed.

Current Conditions -- Native American Uses

Currently members of the Shoshone-Bannock Tribes and the Nez Perce Tribe exercise their off reservation reserved rights to hunt and fish, and claim the right to gather on unoccupied lands within and near the Middle Panther Creek Watershed. The rights of the Shoshone-Bannock Tribes are stated within the Fort Bridger Treaty of 1868 and the rights of the Nez Perce tribe are stated in the Treaty of June 9, 1855. Tribal members actively participate with the Forest Service in land management planning and resource development decisions.

The type and frequency of traditional cultural, spiritual or religious practices conducted in the watershed are not shared by the Tribes with the Forest Service. This does not mean such uses are not occurring or that the area is not of cultural importance to the Tribes. This kind of information is kept confidential in an effort to protect cultural places and other values of traditional, spiritual or religious significance.

Tribal members travel to this area for gathering of teepee poles, camping, fishing, gathering and hunting. The Panther Creek drainage has been identified as a prominent traditional salmon fisheries resource for the Lemhi Shoshone. Tribal fishing in the Panther Creek drainage has declined due to the loss of anadromous fish runs because of water pollution from historic mining activities at the Blackbird Mine.

Traditional hunting, fishing and gathering activities within the watershed have declined significantly since removal of the Lemhi Shoshone people from their ancestral homeland to the Fort Hall reservation in 1907. The distance of the area from Fort Hall, the decline of salmon and steelhead runs and reduced land access because of private land ownership have dramatically affected how the Native Americans use the area.

Despite the decrease in tribal use of the area, the Tribes interest in the protection of Treaty resources remains paramount. The Shoshone-Bannock and Nez Perce Tribes expect federal agencies to honor the trust responsibility regarding the protection of Treaty

resources. The Tribes are interested in sound management decisions and that are based on science and ecosystem management principles.

Management activities that would provide for enhancement of big game habitat, healthy riparian areas and native plant and populations are in the best interest of the Tribes. Projects designed to promote native species of plants and animals and eradicate non-native species are specifically encouraged. Tribal fisheries biologists from the Shoshone-Bannock Tribes are actively involved in restoration of anadromous fish runs in the Panther Creek drainage.

Current Conditions -- Euroamerican Uses

Physical Setting
The Middle Panther Creek Watershed is a unique area with striking contrasts between areas of extensive resource development and disturbance such as is found in the Blackbird Mine area and areas with relatively little evidence of human use.

Opportunities exist for both social interaction and moderate isolation from the sights and sounds of man. It offers scenic vistas and opportunities to view and/or hunt wildlife, and many opportunities for dispersed recreation, such as hiking, backpacking, horseback riding or riding Off Highway Vehicles.

The Frank Church River of No Return Wilderness Area (FCRNRW) was established in 1980 when congress passed the Central Idaho Wilderness Act. The FCRNRW covers over two million acres in Central Idaho. Approximately 11,597 acres of the FCRNRW is located in the Middle Panther Creek Watershed at the head of the Big Deer Creek drainage, Map 1.

Access to the wilderness lands within the watershed is via the Big Deer Creek trail in the Big Deer Creek drainage or from the Yellowjacket Lake area just to the south of the watershed. Wilderness attractions within the watershed include three high mountain lakes, Golden Trout Lake, Cathedral Lake and Deer Lake, renown for high quality fishing. Otherwise use of this portion of the wilderness is limited to big game hunting and general recreation such as backpacking.

Roadless Areas
The Middle Panther Creek Watershed consists of an estimated 58,632 acres of designated Roadless Areas, Map 10.

These designated Roadless Areas are managed according to 36 CFR 294 Subpart C directing Idaho Roadless Area Management that became effective October 16, 2008. The "Idaho Roadless Rule" directs management of roadless areas according to five management classifications that refined the direction of the current Salmon Forest Plan. The five management classifications are: Wild Land Recreation (WLR); Special Areas of Historic or Tribal Significance (SAHTS); Primitive; Backcountry/Restoration (BCR); and General Forest, Rangeland, and Grassland (GFRG). The primary direction provided by

these classifications focus on road construction or reconstruction and timber cutting in the Roadless Areas.

The majority of the Roadless Areas in this watershed are to be managed according to the Backcountry/Restoration classification. In BCR, road construction or reconstruction is only allowed where the Regional Forester determines it to be necessary for resource protection, to allow for existing rights, or for public health and safety. Temporary road construction and commercial timber harvest are only allowed in BCR where necessary to reduce hazardous fuels where there is significant risk that a wildland fire could adversely affect an at-risk community or municipal water supply system, or to improve threatened, endangered or sensitive species habitat or ecosystem health. Areas known as community protection zones within the BCR may be treated more intensely than the rest of BCR.

Some of these Roadless Areas are designated as GFRG. The classification allows these lands to be managed primarily according to the current Forest Plan, but with emphasis on temporary rather than permanent road construction where necessary to implement management actions.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act was signed into law on October 2, 1968 and it established a National Wild and Scenic Rivers System. To qualify, a river or river segment must be in a free-flowing condition and must be deemed to have one or more "outstanding remarkable" scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values.

Based on an eligibility evaluation process conducted by the Forest Service, Panther Creek from its headwaters to the Salmon River (45.6 miles) was determined to meet the qualifications for the following Outstandingly Remarkable Values: Free Flowing, Scenery, Recreation, Geology, Fish and Wildlife. As a result of the Classification/Suitability evaluation, the report concluded that Panther Creek from its headwaters to the Salmon River is eligible for a recommendation for inclusion in the National System with a classification as a Recreational River. Approximately 17 miles of the eligible river segment is within the Middle Panther Creek Watershed.

Management Direction

The Salmon National Forest Land and Resource Management Plan (LRMP) provides direction for several Management Areas within the Middle Panther Creek Watershed, Map 11. These Management Areas include: 5A with an emphasis on long-term timber outputs with a high level of investment, 5B with an emphasis on long-term timber outputs with a moderate level of investment, 4A with an emphasis on managing key big game winter range, 3A-4A with an emphasis on meeting anadromous fish habitat needs and big game winter range, and 3A-5A with an emphasis on aquatic habitat management for anadromous fish and long-term timber outputs.

The LRMP also provides direction on Visual Management using the Visual Quality Objectives system. Visual Quality Objectives (VQO's) are designed to establish

measurable standards or objectives for the visual resource and the established objectives range from Preservation to Maximum Modification, Map 13. Specific designations for visual quality management within the watershed are available in the Forest Plan.

Recreation

Popular recreation activities in the Middle Panther Creek Watershed include camping, picnicking, backpacking, fishing, hunting and winter sports activities, such as cross country skiing and snowmobiling. Two developed recreation campgrounds are in the watershed: McDonald Flat Campground and the Deep Creek Campground. Both of these campgrounds are adjacent to Panther Creek and the Panther Creek Road.

There are numerous dispersed camping sites in the watershed, primarily along the major streams. While there is some use of these sites for summer camping and picnicking the majority of the dispersed camping occurs during the fall hunting season.

Recreation use of the three high mountain lakes in the FCRNRW, Golden Trout Lake, Cathedral Lake and Deer Lake is variable. Golden Trout Lake receives day use due to its proximity to the Crags Campground and motorized access within a short distance of the lake. Cathedral Lake receives overnight use and a relatively high level of use because it is located along the major access trail to the Big Horn Crags. Deer Lake is located along a less used trail and receives light use.

Two big game outfitters and guides conduct operations within the watershed. One outfitter is licensed for bear and mountain lion hunting, but does not have an overnight camp. The second outfitter offers fishing, and hunting trips for elk, deer, bighorn sheep, bear and mountain lion with the use of one spike camp.

Most of the trails in the Middle Panther Creek Watershed were constructed in the late 1920's to early 1950's. The use level on most of the trails within the watershed is low, with the exception of high use in the FCRNRW area at the head of Big Deer Creek. Since the Clear Creek Fire trail maintenance has been difficult with numerous blowouts from storm events and the fire killed trees falling creating a heavy maintenance workload.

Administrative Facilities

There is one Forest Service administrative site within the watershed, the Cobalt Ranger Station. This site used to be the summer work station for the Cobalt Ranger District. Since consolidation of the Cobalt and Salmon Ranger Districts in 1995 this administrative site has not been regularly used as the district summer work station. There are still several offices, a house and some outbuildings that are maintained at the site. The site has a domestic water system and a septic system with a drain field. This site is infrequently used by special project crews.

Authorized Uses

A Special Use Authorization is a permit, lease or easement that allows for occupancy, use, rights, or privileges on lands administered by the Forest Service. In the Middle Panther Watershed there are Special Use Permits for one surface water diversion, three

spring developments, two outfitter and guide operations, one communication site, one underground powerline and two power transmission lines.

Transportation System
The Middle Panther Creek Watershed has a total of 270 miles of roads with approximately 100 miles of open road. The Panther Creek Road (#60055) which bisects the watershed is a main arterial road on the Salmon-Challis National Forest. The Panther Creek Road goes from the Salmon River Road up the entire length of Panther Creek across Morgan Creek Summit and down Morgan Creek to the junction with State Highway 93. The Deep Creek Road is another main arterial road that provides year-round access to the Panther Creek drainage and Middle Panther Creek watershed and the Blackbird Mine from the Salmon, Idaho area.

The majority of the watershed west of Panther Creek does not have roads and is mainly in wilderness or roadless areas; the exception is the Blackbird Creek drainage. Roads in the Blackbird Creek drainage were constructed primarily for mining purposes with the secondary purpose for timber harvest such as in Ludwig Gulch. Within the watershed east of Panther Creek there are fairly extensive road systems in the Woodtick Creek, Copper Creek, Fawn Creek and Deep Creek drainages. The road systems in these drainages were primarily constructed for timber harvest activities.

Many of the roads within the watershed are located in the valley bottoms adjacent to and in close proximity to streams. In some locations this has caused the roads to encroach on the streams and floodplains. Water runoff from the roads has caused sediment loading to streams and contributed to water quality degradation in the watershed. Recently magnesium chloride has been applied to the Deep Creek and Panther Creek Roads to reduce erosion and for dust control.

Private Land
There are approximately 909 acres of patented mining claims and 295 acres of homestead entry sites within the watershed. The Blackbird Mine and the Cobalt town site are located on private land. Most of the dwellings and commercial structures at the Cobalt town site have been removed by Noranda Mining Company due to safety and vandalism concerns. Other private land parcels in the watershed are used for year-round residences, summer homes and livestock pasture. There is a restaurant and bar located on private land at the mouth of Blackbird Creek. This facility serves as a focal point for social activities in the watershed.

Current Conditions -- Commodity Uses

Mining
Mining has played a significant role in the culture and development of the Middle Panther Creek Watershed. After gold was discovered in the Bitterroot and Salmon River Mountains there was an influx of prospectors and an increase in mining activity in the watershed. The historic Thunder Mountain Trail, which crosses the watershed, was used

by miners going south to the Yellowjacket Mining District and west to the mining districts in the South Fork of the Salmon River drainage.

The Blackbird Mine operated intermittently from the late 1800's to the 1980's. The release of hazardous substances from the mine have caused elevated concentrations of both copper and cobalt in Blackbird Creek, Big Deer Creek and downstream in Panther Creek. These releases eliminated the historic salmon and steelhead runs in the Panther Creek drainage.

Various unregulated mining activities through 1967 contributed to a legacy of environmental problems in the Blackbird Mine area. While much of the actual mining occurred on private (patented) land, the environmental degradation is primarily on lands administered by the Forest Service. The mining effects include the degradation of approximately 30 miles of aquatic habitat and the deposition of heavy metal-laden sediments along the water courses downstream of the mine.

Under the direction of the Environmental Protection Agency cleanup actions have been conducted and are ongoing at the Blackbird Mine site to address the release of contaminants and the injuries to natural resources that resulted from the releases. There has been significant improvement in water quality as a result of the ongoing cleanup actions and water quality standards are being met most of the time. However copper levels are not consistently being met downstream of the mine and overbank deposits and stream sediments are still contaminated with heavy metals such as copper, cobalt and arsenic.

There are no active mining operations in the watershed, however recent mining exploration activities in the watershed include drilling for copper and cobalt ore in the Copper Creek, Blackbird Creek and Big Deer Creek drainages. This area is within the Idaho Cobalt Belt, which is a 35 mile long zone containing Pre-Cambrian rocks enriched with cobalt, copper and gold aligned in a northwest trending belt in east central Idaho. Because of the presence of this mineralized zone the Central Idaho Wilderness Act made provisions for future mining exploration and development in the wilderness where this Idaho Cobalt Belt is located.

In Copper Creek, remnants of adits and old cabins associated with mining activity are evident. A small tailings pond (<0.1 acre) associated with the past milling of copper ore is located on National Forest land. This facility was examined by the University of Idaho and was determined to not be at risk of releasing hazardous substances to the environment. The mill structure and associated mining equipment were removed in 2003 and two additional structures were removed by the Forest Service as part of their Abandoned Mine Lands Safety Program.

The proposed Idaho Cobalt Project is located in the Idaho Cobalt Belt in the Bucktail Creek drainage within the Big Deer Creek subwatershed. Mine facilities would include underground workings, adit pads, ore tram, haul road and a water discharge pipeline to Big Deer Creek. A thorough evaluation of this proposed mine is being conducted to

minimize the potential environmental affect of the proposed mine and to ensure that the proposed mining operation does not interfere with the ongoing cleanup actions at the adjacent Blackbird Mine.

Livestock Grazing

The Middle Panther Creek Watershed has 55, 632 acres of rangeland open to livestock grazing in the Williams Basin-Napias Creek Allotment (Map 7). Of this acreage 2,951 acres are considered suitable for livestock grazing. While cattle are authorized to graze the entire allotment, the condition and location of the forage tend to concentrate cattle in the suitable areas. This allotment is grazed by 668 cow/calf pairs from June 11 to October 30 and is managed under a four-pasture, rest-rotation grazing system. Cows are removed from the allotment under a four-stage staggered removal system from September 26 to October 30.

The portion of the Williams Basin –Napias Creek Allotment in the Middle Panther Creek Watershed is located in the Woodtick Creek, Panther-Copper, Panther-Fawn, Deep Creek and Panther-Little Deer subwatersheds. Livestock use is primarily occurring in the upper reaches of the Woodtick Creek, Copper Creek, Fawn Creek, Spring Creek, Deep Creek, Big Jureano Creek and Little Jureano Creek drainages. Topographic barriers keep the livestock from using the lower reaches of these drainages and from coming down into the Panther Creek corridor.

Forest Products

Timber harvest has occurred in the watershed particularly in the drainages on the east side of Panther Creek. Extensive road networks for timber harvest have been constructed in the Woodtick Creek, Copper Creek and Deep Creek drainages. During the 1970's through the early 1990's commercial timber sale activity was common in the watershed. Commercial forest products included saw timber, post and poles, and firewood.

Since the early 1990's the level of commercial timber activity in the watershed has declined significantly due to a variety of factors, such as declining timber markets, the listing of fish species under the Endangered Species Act and a change in focus to fuels reduction in the urban interface. The one exception to a decline in the harvesting of forest products is firewood gathering. Due to the Clear Creek Fire and an epidemic of bark beetles in both lodgepole pine and Douglas-fir trees there has been a significant amount of tree mortality in the watershed providing an increased supply of firewood. Fire wood gathering has resulted in a reduction of large wood recruitment to riparian areas particularly adjacent to high use roads such as the Panther Creek Road.

Description of Reference Conditions, Step 4

This step explains how the ecological conditions have changed over time as the result of human influence and natural disturbances.

Landforms, Erosional and Hydrologic Processes

The landforms and soils in the Middle Panther Creek Watershed have been forming over millions of years. During this time, the area has been subject to changes in climate, from ice ages to periods of volcanic eruption, flood events and periods of drought. The reference condition of the watershed reflects the time period before Euroamericans began to affect the watershed in the 1800's.

Before Euroamericans began to affect the watershed, hillslope processes were affected primarily by climatic fluctuations, such as drought, high precipitation and runoff events, and natural disturbances such as fire and epidemics of insects and disease. Depending on the magnitude of a climatic event or natural disturbance, the effects on hillslope processes may have been significant.

In the reference condition, water infiltration would not have been altered by soil compaction. There would not have been changes in slope hydrology or increases in sediment delivery caused by roads or mining disturbances. In summary, before the influence of human activity, the landscape, erosion and hillslope processes in the watershed were continually adjusting to changes caused by natural disturbances.

Hydrologic Condition of Streams and Riparian Areas

Prior to the arrival of Euroamericans in the watershed the riparian areas and floodplains functioned to capture, store and release water to the streams as subsurface flow. Floodplain inundation would have been frequent and would have served to dissipate stream energy and enhance infiltration. Vigorous riparian vegetation along the streams and in the floodplain would trap sediments delivered to the valleys from the hillslopes, and enhance water infiltration.

Streambank stability would have been high due to the presence of deep rooted, vigorous riparian vegetation. Streambank erosion would have been very minimal even with extreme flow events because the flows would spread out over the floodplain and the riparian vegetation would reduce the water velocity during flood events. Streambank erosion would likely only have occurred in response to a channel obstruction that would cause lateral channel movement or caused by changes in the flow regime due to natural disturbances, such as fire.

Water quality in the Middle Panther Creek Watershed would have been characterized by streams with cool, clear water. Sediment yield would be within the capacity of the streams to transport the sediment and stream substrates would typically have low levels of fine sediment. High intensity storms that would exceed the natural infiltration rates of the various soils would produce surface runoff and short tem turbidity.

Forested Vegetation

I. Forest Potential Vegetation Groups

A. Columbia River Basin Potential Vegetation Groups

Dry Forest PVG:
In native systems, small tree mortality was common due to fire, insects, disease, and competition. A constant unchanging pattern of open communities was maintained. The early seral forest was dominated by shade intolerant species, the mid seral forests were composed of shade tolerant and shade intolerant species and late seral forests were dominated by shade intolerant species. Fire intervals ranged from 20 to 70 years. (Hann, et al. 1997)

Cold Forest PVG:
Early seral and mid seral forests were dominated by shade intolerant species. Shade intolerant species dominated the late seral single layer forests. Late seral multi layer forests were composed primarily of shade tolerant species and lesser amounts of shade intolerant species. Native cold forest systems maintained a high composition of late seral multi layer structure in areas where fire rarely burned.

Underburning fires maintained later seral single layer structure on benches and ridges dominated by whitebark pine and lodgepole pine. Moist, steep slopes burned with lethal crown fires at intervals that allowed development of early to mid seral structures. Trees were thinned by mortality from stress, insects and disease. Fire intervals were highly variable and correlated with landforms. The non lethal underburns had an interval of 30 to 100 years and comprised 10 percent of the landscape. The lethal crown fire regime had a fire return interval of 25 to 300 years and occurred across 25 to 30 percent of the landscape. The mixed fire regime was intermingled with other regimes and occurred across 60 percent of the cold forest type. The fire return interval was 25 to 300 years. (Hann, et al. 1997). Table 18, below, displays the historic distribution of structural stages within each PVG.

Forested vegetation was predominately conifer with patches of quaking aspen and black cottonwood in moist areas. The forested ecosystems were resilient and responded predictably to disturbance (USFS 1996, Hann et al. 1997).

Table 18 Historic Distribution of Structural Stages Within Forested PVGs.

Structural Stages	Cold Forest	Dry Forest
Stand Initiation (si)	23-25%	10-20%
Stem Exclusion (se)	44-53%	25-30%
Understory Reinitiation (ur)	44-53%	25-30%
Young Forest Multi – Story (yfm)	0%	0%
Old Multi Story (ofm)	15-24%	10-15%
Old Single Story (ofs)	6-8%	20-50%

II. Fire Ecology-Reference Condition-Historical Vegetative Structure, Fire Frequency, and Fire Severity for Forested Vegetation by PVG

A. Historical Vegetative Structural Stages (SS)

Composite Structural stage for Dry Forest PVG

Columbia River Basin: The dry forest ecosystems would have forest vegetative structural stages (SS) in combinations as follows: 20 to 50% in ofs; 10 to 15 % in ofm; 25 to 30 % in a mixture of seo, sec, ur, and/or yfm; 10 to 20% in si; and 0 to 15% in non-forest (Hann et al. 1997, pg 481).

Central Idaho (ERU 13): The dry forest would have structural stage (SS) combinations as follows: 13 to 43% in ofs; 12 to 16 % in ofm; 31 to 37 % in a mixture of seo, sec, ur, and/or yfm; 10 to 21% in si; and 0 to 15% in non-forest (Hann *et al* 1997, table 3.60, page 565).

Middle Panther Creek Area: The Dry Forest PVG (PVTs 52, 74, 75, and 133) would have SS combinations as follows: 15 to 40% in ofs; 20 to 40% in seo; 5 to 10 % in ofm; 10 to 25% in a mixture of sec/ur/yfm; 15 to 20% in si.

Composite Structural stage for Cold Forest PVG

Columbia River Basin: The Cold Forest PVG would have SS combinations as follows: 6 to 8% in ofs; 15 to 24 % in ofm; 44 to 53 % in a mixture of seo, sec, ur, and/or yfm; 23 to 25% in si (Hann et al. 1997, table 3.36, page 494).

Central Idaho (ERU 13): The Cold Forest PVG would have SS combinations as follows: 8 to 12% in ofs; 10 to 24 % in ofm; 42 to 50 % in a mixture of seo, sec, ur, and/or yfm; 24 to 28 % in si (Hann et al. 1997, table 3.64, page 570).

Middle Panther Creek Area: The Cold Forest PVG (PVTs = 66, 68, 69, 70, 71) would have SS combinations as follows: 5 to 15% in ofs; 10 to 40% in seo; 5 to 25 % in ofm;, 20 to 45% in a mixture of sec/ur/yfm; 15 to 30% in si.

B. Historical Fire Frequency for Forested PVGs

Dry Forest PVG

Columbia River Basin: The dry forest would have ranged from 20 to 70 years (Hann et al. 1997, page 484).

Central Idaho (ERU 13): The Columbia River Basin assessment found fire frequencies in Central Idaho **(**ERU 13) of 20 to 70 years for the dry forest PVG (Hann et al. 1997).

Middle Panther Creek Area: the Dry Forest PVG includes Fire Regime Groups I and III (See Appendix H, cohesive strategy 2002, Hann et al.) with a mixture of 0 to 35+ years of surface fires and 35 to 100+ years of mixed severity fires.

Cold Forest PVG

Columbia River Basin: For the Cold Forest PVG, Hann (Hann et al. 1997, page 492) states, “Historically, fire intervals in the cold forest PVG were highly variable and correlated with landforms. The non-lethal under burning regime that maintained the late-seral single-layer and some mid-seral physiognomic types, generally comprised approximately 10 percent of these landscapes, and typically occurred on ridges and flat benches. The fire-return interval on these landforms varied from 30 to 100 years. The lethal crown-fire regime generally occurred across 25 to 30 percent of the Cold Forest PVG, and had a fire-return interval which varied from 25 to 300 years. Shorter intervals generally occurred on steeper slopes recycling mid-seral to early-seral physiognomic types. Longer intervals occurred in wet bottoms and basins, which typically supported the late-seral multi-layer physiognomic type. The mixed fire regime was most common and occurred throughout 60 percent of the PVG; mixed-fire return intervals varied from 25 to 300 years. The mixed-fire regime was often intermingled with the other regimes, either during one fire event or through a series of fire events. The Cold Forest PVG had a relatively short fire season, generally only lasting for the month of August. Most fires were very small, but a few occasionally grew very large”.

Middle Panther Creek Area: the Cold Forest PVG includes Fire Regime Groups III and IV (See Appendix H, cohesive strategy 2002, Hann et al.) with a mixture of 35 to 100+ years of mixed severity fires and replacement severity fires.

C. Historical Fire Severity for Forested PVGs

Fire Severity for Dry Forest PVG

Columbia River Basin: The dry forest would have been 80% non-lethal, under-burning fires, 5% mixed lethal, and 15% crown fires (lethal) (Hann et al. 1997, page 484**).**

Middle Panther Creek Area: The dry forest had 70% of its landscape sustaining a surface or mosaic fire, and 30% experiencing replacement fire severity (see Forested Vegetation Appendix B.).

Fire Severity for Cold Forest PVG

Columbia River Basin: The cold forest would have been 10% non-lethal under-burning fires occurring mostly on ridges and flat benches, 60% mixed lethal, and 25-30% crown fires (lethal) (Hann et al. 1997, page 493**).**

Central Idaho: Losensky described fire severity in the Lodgepole pine cover type (Cold Forest PVG) as follows; under-burning on a 50-year cycle with stand replacements at 75 to 150 years (Losensky 1994). Morgan reported a mixed lethal regime on the cool dry and warm dry sites in these ecosystems and a lethal fire severity on the cool moist sites (P. Morgan et al. 1996 Final Report RJVA-INT94913.)

Middle Panther Creek Area: The Cold Forest PVG had 15-35% of its landscape sustaining a surface or mosaic fire, and 65-85% would have been a replacement fire severity (see Forest Vegetation Appendix B.).

Fisheries

Salmonids within the Middle Panther Watershed characterize species which populated drainages throughout the Columbia River Basin in association with the most recent ice age (Pielou, 1991) and have thrived within these landscapes over the past 10,000 years. Historically, the abundant coldwater streams of the basin supported a wide variety of salmonids. Cutthroat trout are thought to have been the earliest established form of salmonid in headwater drainages of the Columbia River basin, crossing hydrographic divides in times and places of geologic change, to populate headwater areas of the Salmon River, plus the Snake, Missouri and Colorado River drainages as well (Behnke, 1979; Behnke, 1992; VanEimeren, 1996). Historical accounts indicate that cutthroat trout in general, often referred to as the Mountain Trout or Black Spotted Trout, were the primary historic resident fish species throughout the Rocky Mountain region, attaining lengths of 3 feet and weights of up to 30 pounds. (Hornaday, 1904). Redband (rainbow) trout were believed to be widely distributed, occupying waters from southern desert basins to mountainous coniferous forests (Jordan, 1892; Gilbert and Everman, 1895).

Two other species of primary historic significance, anadromous Chinook salmon and steelhead, were abundant within watersheds of the region which were free of barriers along migration routes to and from the Pacific Ocean. These species utilized freshwater habitats of the inland watersheds for early life rearing, and again for spawning purposes

after having spent several years within more productive oceanic environments. Historically, the Panther Creek drainage, including the Middle Panther Creek Watershed, supported Native American uses which included utilization of the anadromous fisheries resources present within the watershed.

In addition to anadromous species, this watershed would also have been historically accessible for adfluvial (inland migratory) forms of native salmonids including rainbow, westslope cutthroat and bull trout.

Fish Habitat

Reference conditions of aquatic habitats within the Middle Panther Creek Watershed would reflect the absence of a number of land management actions which have shaped the current environment over the last 200 years. In the absence of human management influences, aquatic habitat condition would have been shaped almost exclusively by natural hillslope and hydrologic processes in combination with natural disturbances including wildfire events and forest insect and disease infestations.

With the exception of areas above the natural falls within the Big Deer Creek subwatershed, aquatic habitats of streams of the watershed would have been well connected, allowing for unimpaired fish migration both within and between watersheds and basins. In the absence of management-induced impacts to water quality, streams throughout the watershed would have provided cool and clear habitats for coldwater fish species. Based upon stream gradients of four percent or less, approximately 25 miles of a total of 51 stream miles in mainstem Panther Creek, Deep Creek, Blackbird Creek and Woodtick Creek were likely utilized for historic anadromous fisheries spawning and rearing, including 98 percent of mainstem Panther Creek's length within the watershed, 43 percent of Deep Creek's length, and 35 percent of Blackbird Creek's length.

In the absence of the influence of fire suppression, larger fires would have been more frequent within the watershed, but with a reduced general intensity. In combination with the absence of roads, more vigorous and complex streamside vegetation would have provided for ample stream shading and streambank stability, as well as effective capture of offslope sediments. Low or moderate gradient streams would have had unimpeded access to their floodplains during high flows.

Terrestrial Habitats

The following discussion considers the historical condition and representation of the various habitats within the Middle Panther Creek watershed assessment area. These estimates are based on what conditions would probably have existed approximately 200 years ago, at the approximate time of European settlement.

Sagebrush/Grassland communities: Historically, wildlife use of these areas was very similar to current except for seasonal (spring) use by grizzly bear and greater presence of gray wolf packs. These communities were historically more productive than today due to the lack of competition from noxious weeds in some areas and the absence of effects from domestic livestock grazing. Also, prior to European settlement, wildlife disturbance

due to the presence of people and livestock on and adjacent to these communities, especially at the lower elevations, was probably not a factor.

Douglas-fir Series: Douglas-fir communities experienced a mixed fire regime ranging from more frequent understory burns at lower elevations to less frequent, stand replacing burns at higher elevations, where lodgepole pine is a seral species. The fire return interval is generally longer than that of lower elevation drier forest. The amount and distribution of the various structural stages varied more through time and across the landscape thus resulting in more multi-strata stands that, at the upper elevations, also contained a mix of conifer species. These factors, in turn, would have determined the temporal and spatial distribution patterns of various wildlife species which utilize this habitat. The species present historically were essentially similar to those occurring today; however, the structural diversity of these stands provided a greater abundance of niches for small mammal and birds. The density of resident and neotropical birds, especially, would likely have been greater than it is currently. Seral stands of lodgepole pine, resulting from fire events, would have been more prevalent within this type. Big game hiding cover may have been periodically more abundant than today. This series likely occupies more acreage today compared to historic conditions because of fire suppression efforts. The positive side of this increase is that most of the big game hiding cover is provided by Douglas-fir stands and consequently may be partially responsible for the general increase in elk numbers compared to historic conditions throughout the watershed.

Subalpine Fir Series: These high elevation cold forests experience long fire return intervals of up to several hundred years. As a consequence, when fires do occur, they are much more likely to be stand-replacing fires than are the more frequent fires in the lower, drier forest types. Since the upper elevation sites in this series often remain in climax condition for many decades or even several centuries, it is highly likely that the general appearance and acreages of these sites varies little over time. Consequently, available habitat for species such as pine marten, lynx, fisher and summering big game animals have also probably remained relatively constant except for brief intervals after the widely spaced fires. Although these habitats historically were occupied by the same assemblage of species as today, mountain goats, bighorn sheep, lynx, wolverine, and probably grizzly bear occurred in much higher numbers than today.

Whitebark Pine Series: Whitebark pine stands have always been confined to the highest elevations of this watershed. Fire suppression has likely been a factor that has contributed to present day acreages. Historically, these stands would have been utilized by both grizzly and black bears, just prior to denning whenever cone crops occurred. These stands offered very good summer big game habitat and were especially used by elk, deer, bighorns and mountain goats during hot summer months when insects were most active.

Non·forested Alpine Plant Communities: This minor component of the watershed was never prevalent and the reference condition is thought to be essentially the same as currently exists.

Riparian Areas and Wetlands: Prior to European settlement, there likely was a conifer/cottonwood overstory component of riparian areas along the lower elevations of Panther Creek and major tributaries. These areas were among the first modified by activities such as clearing for pasture/cropland and logging. Consequently, small remnants of this type exist today. At the lower elevations in the assessment area alder, water birch and willow would have been present in abundance and undoubtedly supported large numbers of beaver where stream gradients permitted. In the higher elevation riparian areas, cottonwood would have been scarce to absent and the conifer types would have included understory species such as red osier dogwood and current. Alder would have been well represented in these areas, as it is today. Sites which support willows today probably represent only a small remnant of former distribution due to reduced numbers of beaver and land development activities.

Other minor riparian community types in forested areas (grass/sedge/forb, spruce bog, honeysuckle/elderberry, etc.) are difficult to quantify but would have been present in approximately the same extent historically as today. Wetlands, though uncommon in the assessment area today, were much more abundant historically due to the presence of large beaver pond complexes along the lower portions of tributaries in flat valley bottoms. These wetlands and associated riparian areas served the same function historically that they do today, but occupied more area, as noted above, and were utilized by greater numbers of migratory birds and other species such as moose.

Snags and Down, Woody Debris: Lower, drier forests would probably have contained more large snags but less down, woody debris prior to timber harvest, fire suppression and firewood cutting. Mid-elevation, more mesic forests would have contained more large snags and more woody debris while higher elevation, colder, wetter forests which experienced mixed fire regimes and longer fire return intervals may not have been perceptibly different than currently. Insects and disease contributed to presence of down, woody debris then, as now. In addition, non-stand replacing fires which wounded or killed trees, but did not consume the fiber, would have increased the number of snags available and the amount of down, woody debris. These habitat components served the same function historically, although the number of species and individuals within those species dependent on snags and down, woody debris, including birds and mammals, were likely more numerous historically.

Older forest habitat: The total amount of older forest in the assessment area historically, was very likely higher than current levels. Much of this difference is due to timber harvest, primarily in the low to mid-elevation Douglas-fir stands within the easily accessible areas of the watershed. Older forest habitat historically served the same function as it does today, although at a higher level of productivity, especially in the interior Douglas-fir and whitebark pine cover types.

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Aspen: Aspen was historically maintained within both the forested and non-forested ecosystems through periodic fire which removed competing conifers and rejuvenated the clone. Since only aspen clones five acres or larger are delineated in the aerial photo

interpretation of the assessment area, aspen within the assessment area is likely greatly underestimated. Historically, aspen would have occupied much greater acreages than today, as is evidenced by the scattered remnants of clones within coniferous forest and riparian areas. Vigorous aspen clones are a rich and valuable wildlife resource wherever they occur. Historically, aspen in the assessment area would have been unaffected by domestic livestock grazing and various age sprouts would have been abundant. Decadent aspen clones would have been uncommon and the aspen habitats would have generally been much more productive.

Mountain Mahogany: Mountain mahogany stands in the assessment area were historically subjected to frequent, small-scale disturbances from low severity fires. Such perturbations created gaps in both the canopy of overstory conifers and mature mahogany plants, and likely kept this species confined to areas not subjected to fire. Although the area occupied by such stands may have been less than today these sites would have been used historically by bighorn sheep and mountain goat. Stand vigor would have varied depending on site, density of wild ungulates, and season and degree of use.

Rock Habitats: Rock habitats historically occupied much the same acreages as today. These habitats, consisting of outcrops, cliffs and talus, were used by species such as bats, pika, marmot and mountain goat, much as they are today.

Native American Uses

Archeological studies of the watershed indicate that portions of the watershed have a rich cultural heritage. The archaeological, or prehistoric, record suggests that Native American Indian use of the area began as early as 10,000 years ago when indigenous groups depended upon the bighorn sheep, salmon, plants, and animal resources for subsistence. This hunting and gathering economy persisted until ca.1800, when the Northern Shoshone Tribes found themselves in cultural transition due to increased mobility through the adoption of a horse economy. This new mobility led them east over the mountains to the Great Plains to hunt buffalo. During this period the buffalo hunt greatly influenced the material and social traditions of the Northern Shoshone.

Despite the introduction of the horse, and consequent adoption of several aspects of Plains culture, many of the Shoshone inhabitants of the Salmon River Mountains held on to their ancient specialty and skill in hunting mountain sheep (Liljeblad 1072). This is why they became known as Sheep Eater Indians. Groups of Shoshone that lived and fished along the rivers and streams were called Salmon Eaters (Trenholm and Carley, 1998). Members of the Sheep Eaters, Salmon Eaters and other Shoshone bands that chose to adopt the horse culture emerged later as the Lemhi Indians.

Of all the external influences affecting the life and culture of the Northern Shoshone inhabiting the watershed, none was as significant as the arrival of European settlers to the Lemhi and Salmon River valleys in the mid to late 19th century. The new settlers began farming and ranching in the valleys and mining and prospecting in the mountains.

By 1822 the first trappers and explorers had entered the Salmon River Mountains and probably were exploring in the Panther Creek drainage. Before the turn of the century Euroamerican use was relatively sparse in the area compared to other regions of the west. However, Euroamerican presence increased rapidly in 1866 when gold was discovered in the Salmon River Valley.

It was the Euroamerican demand for land and resources, including fertile soil, rangeland and mining activities, as well as Indian wars that prompted the 1868 Virginia City Treaty. The treaty intended to set aside a reservation of land in exchange for the cession of millions of acres of Lemhi aboriginal territory. However the treaty was never ratified and it wasn't until 1875 that an Executive Order by President Grant formally established the Lemhi Reservation. The Lemhi Reservation consisted of 160 square miles of land in the Lemhi Valley. In 1907 the Lemhi Indians reluctantly gave up their reservation in the Lemhi Valley under the pressure of depleting resources and Euroamerican encroachment and moved to the Fort Hall Reservation near Pocatello, Idaho.

The Nez Perce Indians often came to the Salmon River area for fishing and trade with the Shoshone. Popular meeting places were the fishing ground at the junction of the Lemhi and Salmon Rivers, and the confluence of the North Fork of the Salmon River and the Salmon River. Due to the presence of anadromous fish runs in the Panther Creek drainage it is likely that Native Americans used this area for fishing also.

Extensive cultural resource inventories have been conducted in the watershed. Over 11,000 acres, approximately 10 percent of the watershed, has been inventoried for cultural clearance of range improvement projects, timber sales, prescribed fires, mineral exploration projects and proposed mining projects. These inventories resulted in the identification of lithic scatters, plant processing camps, pictographs, rock shelters and talus depressions of unknown function.

Some of the existing recreation trails in the watershed were likely constructed on top of early Native American travel routes. It is expected that further inventory of the area would result in the location of additional rock shelters, and pictograph sites, upland hunting and gathering places and fishing camps along the major streams.

Euroamerican Uses

Mining has played a significant role in the development of the Middle Panther Creek Watershed. The Blackbird Mine has operated at varying levels of activity from the late 1800's to the 1980's. Mineralization in the Blackbird Mine area was discovered in 1892 when a prospector found copper mineralization along Blackbird Creek. Cobalt was recognized in 1901 but there was no market for cobalt at that time. Exploration and development of copper and cobalt ores in the Blackbird Mining district has continued sporadically ever since. Several million tons of ore have been produced from both underground and surface mines in the district, primarily from the Blackbird Mine. Development at the mine eventually consisted of some 15 miles of underground workings, an open pit, milling facility and tailings impoundment. Historic impacts from mining operations at the Blackbird Mine are currently being remediated by the Blackbird

Mine Site Group (BMSG) under the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA**), commonly known as “Superfund. Exploration of other mining prospects in the area occurs when metal prices provide incentive.

Synthesis -- Step 5

The purpose of this step is to compare the existing and reference conditions of the ecosystem elements and to identify the key management objectives.

Erosional and Hydrologic Processes

Except for some localized areas in the Blackbird Mine site, there has been very little change in the hillslope processes that functioned in the watershed prior to the arrival of early trappers and settlers, The predominate hillslope processes are the infiltration and movement of water downslope, overland flow and surface erosion. In areas where changes have occurred the hillslope processes that have changed include changes in soil infiltration rates, water interception and surface erosion.

In the Blackbird Mine area there are large unvegetated areas resulting in flashy runoff and increases in surface erosion and changes in the timing and magnitude of runoff volumes. In the Bucktail Creek drainage an open pit, waste rock dumps and numerous roads are located in the cryic headlands. These headland landforms have numerous dissections due to the concentration of water on the steep slopes and overland flow is common in this landform. The location of these mining facilities on this landform has caused even flashier runoff from the headwaters and an increase in the frequency and magnitude of peak flow events in Bucktail Creek.

The Clear Creek Fire (2000) burned a major portion of the Middle Panther Creek Watershed, including most of the Blackbird Creek drainage, all of the Little Deer Creek drainage and about two thirds of the Big Deer Creek drainage. Water yield has increased in the watershed due to changes in precipitation interception and reductions in transpiration as a result of the fire.

An analysis and comparison of pre-fire versus post-fire streamflows in the vicinity of the Blackbird Mine and proposed Idaho Cobalt Project indicates that current watershed yields are approximately 50 percent higher than pre-fire conditions Sediment yield modeling estimates that the Clear Creek Fire caused sediment yields to increase by a factor of two to five times over pre-fire conditons in the years immediately following the fire (Hydrometrics, 2006). Sediment monitoring data shows that by 2006 sediment levels in Panther Creek had returned to pre-fire levels. The effects of the fire on surface water runoff and sediment yield will continue to decease over time as vegetation recovers and infiltration rates return to pre-fire levels.

Hydrologic Condition of Streams and Riparian Areas

Riparian vegetation along Blackbird Creek and Bucktail Creek is lacking in vigor, density and distribution as a result of the deposition of contaminated sediments along the streams. This lack of vigorous riparian vegetation has caused the stream channels/valley bottoms to become very unstable and susceptible to bed, bank and valley erosion during high flow events.

Water quality in all the streams draining the Blackbird Mine area has been severely degraded due to the release of hazardous materials from the mine site. The ongoing CERCLA cleanup efforts have made a significant improvement in water quality in Big Deer Creek and Panther Creek however the water quality standards are still not being consistently met in either stream. The water quality criteria for both copper and cobalt are still exceeded at times, particularly during high flow events, when contaminated sediments are mobilized from the channels and floodplains.

Roads in the watershed, particularly the Panther Creek Road and the Blackbird Road, have encroached on the floodplain and active channel in some locations. This has caused a reduction in riparian vegetation and a reduction in channel/floodplain capacity. In areas where the channel/floodplain capacity has been reduced this can result in higher flood stages and increased velocity during high flow events.

Forested Vegetation

A. Dry Forest Potential Vegetation Group

Columbia River Basin

The areas of highest departure from natural conditions were those that had been harvested, favoring the removal of high value, large shade intolerant tree species and leaving shade tolerant, fire and insect disease susceptible species. The composition of late-seral single-layer shade-intolerant (ie, ponderosa pine) forest had declined by 25 percent from historical amounts. In addition, current period landscapes had a mixed composition rather than being dominated by shade-intolerant species. This was particularly true in areas that had been actively harvested and in areas where fire suppression has been effective. Increased fire intervals without a decrease in fuels has produced higher fuel loads and fire intensities. (Hann et al. 1997, page 487).

Central Idaho

"For the Dry Forest PVG, the late-seral single-layer forest type was well below the [amounts of] natural condition, whereas the late-seral multi-layer forest type occurred at the upper limit of the historic condition. The late-seral single-layer forest type largely converted into the mid-seral forest type because of insect, disease, and stress mortalities in the overstory layer, and growth of shade-tolerant layers in the understory." (Hann, et al. 1997, pg 563) "These transitions occurred primarily as a result of fire exclusion. Fire exclusion substantially reduced the extent of the non-lethal and mixed fire regimes that maintained late-seral single-layer types, and that thinned shade-tolerant tree species in

early-, mid-, and late-seral multi-layer types. Timber harvest activities largely occurred in the peripheral areas of the Central Idaho ERU, where the larger, shadeintolerant tree species were those primarily selected for harvest. These trees were more resistant to insect, disease, and stress mortality. Clearcutting and seed tree timber harvest activities commonly created small patches of early-seral structures containing few live or dead-standing trees, and high down fuel accumulations." (Hann, et al. 1997, pg 563)
"For Central Idaho (ERU 13) fire exclusion substantially reduced the extent of the non-lethal and mixed fire regimes that maintained late-seral single-layer types, and that thinned shade-tolerant tree species in early-, mid-, and late-seral multi-layer types." (Hann, et al. 1997, page 563).

Middle Panther Creek Assessment Area
Stand initiation (si) structural stage is greater than historic levels on the west side of the Middle Panther Creek Area due to wild fire and logging, mostly wildfire. Stem exclusion (SECC & SEOC) structures are less than natural levels in the assessment area. Understory reinitation (si) is less than natural levels in Middle Panther Creek Area subwatersheds. There is more of the young multi story (yfm) structural stage in the watershed than historic conditions due to human caused disturbances.

Old multi story (ofm) is over-represented in the dry conifer PVG of the landscape due to lack of fire surface fires (nonlethal severity). Old single story (ofs) is under-represented in the entire watershed due to lack of low and moderate severity fires.

B. Cold Forest Potential Vegetation Group

Columbia River Basin
Tree densities and fuel loads have increased from historic condition as a result of fire suppression. Changes in landscape structure and composition have resulted in higher fire intensities and fuel loads. (Hann, et. al. 1997)

Central Idaho
The extent of early seral forests is higher than historic range of variability, mid seral type is below historic range of variability, late seral multi layer is within historic range of variability, and late seral single layer is above its historic range of variability. The amount of early seral shade tolerant species is above historic range of variability and the extent of mid seral and late seral species are below their historic range of variability. The change in mid and late seral is due to decline in whitebark pine due to fire exclusion and being replaced by subalpine fir (Hann, et al. 1997).

Middle Panther Creek Assessment Area
Within the assessment area, stand initiation (si) structural stage is under-represented when compared to historic condition in the watersheds. Stem exclusion stage is less than natural conditions in the watersheds. Young multi story (yfm) is over-represented in area due to timber sales and wildfires. Old single story (ofs) structural stage is less than natural conditions in the watersheds because of less low intensity fires.

II. Fire Ecology

The key questions require discussion regarding risks to social and ecological elements due to altered vegetation structure and fire behavior. These topics are inseparable for the synthesis process; therefore the fire ecology synthesis discussion will combine questions 1 and 2.

The synthesis discussion will address the following topics:
• Summary of high-risk crown fire.
• Fire Regime Condition Class.

A. **Summary of high-risk crown fire initiation fuel profiles:** In the Dry Forest PVG, the amount of forest area with high-risk crown fire fuel profile has increased from the historical landscape on the east side of assessment area. High-risk crown fire initiation fuel profiles are those forest structural stages with a closed forest canopy and abundant ladder fuels (seedlings, saplings, and pole size trees), in particular the ofm and ur. The stem exclusion closed canopy structural stage has a closed canopy and is at high risk for crown fire spread, but lacks the ladder fuels for a crown fire to generally initiate within those stands. Therefore, it will not be included in this discussion of high risk crown fire initiation fuel profiles.

The Dry Forest PVG makes up 67% of the forested ecosystem of the landscape and 47 % of the dry forest PVG in the Middle Panther Creek area have high risk crown fire initiation fuel profiles (multi-layer forest canopy (ladder fuels) structural stages). The Cold Forest PVG makes up 33% of the forested ecosystem of the landscape and 60% of the cold forest PVG area has high risk crown fire initiation fuel profiles (multi-layer forest canopy (ladder fuels) structural stages). Combined, these two PVGs contain approximately 41,000 acres of high risk crown fire forest structure.

This high concentration of potential crown fire fuels is located in a landscape on the windward side of much of the Lemhi County Wildand Urban Interface (WUI) Zone Areas in Lemhi County, Idaho. Due to the regularly experienced high fire danger weather conditions, prevailing wind patterns, steep mountain topography, and canyons that line-up with fire season wind direction, risk to wildland urban interface, and risks for sustaining ecosystems the wildland urban interface is at increased risk of wildfire due to altered forest structure and the continual distribution of closed canopy forest structures.

B. **Fire Regime Condition Class and predicting risk to Wildland Urban Interface**:

Fire Regime Condition Class (FRCC) and related values were calculated for the Middle Panther Creek EAWS area.

Forested Vegetation Appendix C describes the vegetation indicators used to derive the FRCC. These values are important as related to wildfire behavior, especially wildfire

burning under high or extreme fire weather conditions. Table 19 displays FRCC classes by PVGs.

Table 19 FRCC Distribution Within Forested PVGs.

FRCC Classes	NRV or HRV Departure*	Dry Forest	Cold Forest
1	None, Minimal, Low	4%	23%
2	Moderate	70%	70%
3	High	26%	7%

***** Natural Range of Variation or Historical Range of Variation.

Fire Regime Condition Class is a calculated value for a particular ecosystem in a given drainage. It is not a value that can be assigned to a given stand of forest or small patch of shrub ecosystem. As such, it is reflective of the current condition of the ecosystem (vegetation/fuel characteristics) in the context of the surrounding landscape. Context combined with current structure is exactly what influences extreme fire behavior.
Fire Regime Condition Class provides a picture of potential fire behavior under high or extreme fire weather conditions because it considers the context of the surrounding vegetation/fuel structure that would contribute to uncharacteristic fire behavior (e.g. amassing of extreme heat or winds).

The Dry Forest PVG throughout the Middle Panther Creek area was classed as follows: 4% in Condition Class 1; 70% Condition Class 2; and 26% in Condition Class 3. These values have been heavily influenced by the significant increase in multi-story forest structures (ur, yfm, and ofm) that have multi-storied fuel profiles (ladder fuels).

It is important to understand that the majority of both the Dry and Cold Forest PVGs were in FRCC 2 or 3, and that only 4% of the Dry Forest PVG was in FRCC 1.

The condition class 3 areas mentioned above include the lower and mid-elevations of the forested ecosystems in the Middle Panther Creek area. As seen in the fires of 2000 and 2003, these fuel situations have the capability to burn with extreme, un-stoppable fire behavior and produce fire-spotting miles ahead of the main fire. It should be noted that Condition Class 2 also has similar capability for extreme fire behavior when fire weather conditions become high or extreme and topographic features line up with wind patterns allowing a wildfire to be pushed by high wind conditions generated from a large fire or high wind event.

Fish

While occurrences of adult spawning have been observed during the last seven years in response to Idaho Department of Fish and Game efforts to re-establish runs, Chinook Salmon and steelhead have been largely extirpated from the Panther Creek drainage and the Middle Panther Creek Watershed as a result of human-caused changes which have occurred both within and outside the watershed. Westslope cutthroat trout and bull trout still occur within the watershed, but also in reduced numbers compared to historic

conditions. Since the initiation of clean-up efforts at Blackbird Mine, however, substantial progress has been made in restoring water quality of impacted streams, and salmonid fish are beginning to reoccupy lower Blackbird Creek and Big Deer Creek downstream of the South Fork of Big Deer Creek. Although fish populations have increased along main Panther Creek in recent years, population status is still categorized as depressed.

Fish Habitat

Historically, migratory accessibility and spawning and rearing habitat for both anadromous and resident fish were more abundant and in better condition than currently exists within the Middle Panther Creek Watershed. Impacts to aquatic and riparian habitats in this watershed have developed primarily in association with the occurrence of mining and roadbuilding activities beginning around the turn of the century. Water quality, habitat access, watershed and channel condition, and aquatic habitat elements have been negatively affected by these activities. Copper and cobalt levels still periodically exceed water quality standards in streams adjacent to historic mining activity and are a limiting factor to fisheries production potentials in these streams. Blackbird Creek, lower Deer Creek and mainstem Panther Creek downstream of Blackbird Creek are listed as 303d Water Quality Limited reaches due to periodic water chemistry contamination from high flow transport of metals laden sediments. Blackbird Creek is additionally listed as a 303d Water Quality Limited Segment due to elevated instream sediment levels. These same contaminated sediments have retarded development of riparian vegetation in Blackbird Creek, exacerbating bank erosion problems in this stream during high flow events.

The Panther Creek and Blackbird Creek roads encroach on their respective streams for most of their lengths. Both floodplain connectivity and riparian vegetation development have been negatively impacted in these areas. Road encroachment combined with a general lack of large woody debris has also limited development of high quality pool habitat in mainstem Panther Creek reaches within the watershed. Standing dead trees between the road and the creek have been cut for firewood or removed as hazard trees, resulting in fewer pools. Human-created barriers to fish access within the Blackbird Creek and West Fork Blackbird Creek drainages have additionally reduced potential fish refugia opportunities in cleanwater reaches of these streams.

Changes in fire regimes from those which shaped reference conditions, reflective of years of active suppression strategies, have also produced changes in nearstream vegetation structure which have negatively impacted water quality, streamflow regimes and instream habitat elements within the watershed. The Clear Creek Fire of 2000, in particular, has produced significant impacts to aquatic habitat elements within Blackbird Creek, Big Deer Creek, Little Deer Creek and mainstem Panther Creek, with the Risk of Cumulative Watershed Effects in each of these subwatershed being currently ranked as high.

The current conditions of key aquatic habitat elements are the primary limiting factors affecting both resident fish species and populations within the Middle Panther Watershed

today. In addition to aquatic habitat impacts occurring within watershed, however, impacts occurring outside the watershed, most notably direct fish mortalities related to operations of the Columbia and Snake River'a hydropower dams, have contributed to the decline of the anadromous fisheries resources of the Middle Panther Creek Watershed.

Terrestrial Habitats

Human presence, activities and management practices have altered much of the available wildlife habitats within Middle Panther Creek watershed. As a consequence, distribution of all wildlife species utilizing these habitats has also been affected. Actual effects vary greatly and will be briefly discussed.

Sagebrush/grassland Communities: The actual area occupied by sagebrush/grassland communities today is approximately the same as the estimated historic condition. However, these communities have been altered in various ways since European settlement. The first change probably occurred when domestic livestock were introduced in the watershed. The heavy, unregulated grazing reduced the grass component of these communities and favored sagebrush, a relatively unpalatable species. Fire exclusion efforts further enhanced sagebrush proliferation thus leading to sagebrush stands with a high canopy closure. Many of these stands remain in this condition today, at the expense of the grass/forb component. The lack of fire has also facilitated conifer encroachment upon these native grasslands which is a threat to the integrity of these communities. In the past few decades, noxious weeds such as cheatgrass and spotted knapweed have become established along some travelways adjacent to these communities. These exotic species are a concern and a potential threat that may spread to the native grasslands. Once established, these species can be easily spread by disturbances such as fire and movement by humans and ungulates alike.

Upland sagebrush wildlife species such as Brewer's sparrow and vesper sparrow are likely more abundant in these communities today than they were historically, while greater sage-grouse populations have probably declined. Microtine rodents which utilize the grass/forb component of these communities are probably less abundant today as would be small mammalian and avian predators that utilize them as prey species. Spring through fall forage production for big game species such as elk is much less in these altered communities. However, sagebrush is utilized by species such as elk and mule deer during winter, when snow depths make it difficult to use grass and forb species. Management objectives for these communities should identify the control of noxious weeds, the restoration of native bunchgrasses, and increase the diversity of the sagebrush stands.

The Douglas-fir communities have likely increased from historical estimates and it appears that age, structure and other characteristics of these stands have also changed. Primary reasons for the observed differences such as younger-aged stands, more multi-storied stands, higher stocking rates, paucity of large-diameter, old trees and prevalence of seral lodgepole pine stands include timber harvest and stand management activities and fire exclusion. However, other changes include greatly reduced stand densities

caused by Silvicultural treatments such as shelterwood or seed-tree harvests and stand replacement via clearcuts. Conditions in some areas currently resemble those occurring after a stand-replacing fire as lodgepole pine regenerates while on other areas little or no regeneration is occurring. A common feature of all sites is the lack of snags and down, woody debris. Such changes, though similar to natural events, probably did not historically occur on small areas very often because conditions severe enough to precipitate a stand-replacing fire generally resulted in large burns.

Effects of the changes in Douglas-fir communities vary by species and locations within the watershed. In general, the expansion of this forest type has favored elk and mule deer, both of which largely depend upon such communities for thermal and hiding cover throughout the year. However, fragmentation events such as timber harvest units and road construction within cover blocks, is generally detrimental to big game species. In addition, interior forest species such as many neotropical migratory birds and pine marten often are adversely affected by such fragmentation in that it creates an edge effect that is conducive to nest predation, parasitism by brown-headed cowbird and competition from non-interior species. Loss of snags and large diameter trees due to activities such as firewood gathering and timber harvest adversely affects all primary, secondary and obligate cavity nesters ranging from pileated woodpecker to mountain and black-capped chickadee. Also adversely affected are small mammals such as long-eared myotis and red-backed voles. In pre-settlement times, more frequent low-intensity fire in the lower Douglas-fir communities helped maintain large expanses of older forest in park-like stands. Infrequent stand-replacing fires at upper elevations regenerated the large blocks of Douglas-fir required for interior species and species needing solitude or cover.

Subalpine fir communities constitute high elevation, cold forests that typically occurred and continue to occur as rather stable climax forests during long periods between catastrophic events. Large expanses of seral lodgepole pine often are present within these communities for many decades following disturbances such as fire. These forests commonly occur as mixed conifer stands with Douglas-fir in the lower elevations and whitebark pine or limber pine in the upper elevations. With the exception of limited timber harvest and associated road construction, these communities have changed very little within the watershed since pre-settlement times. As a consequence, effects on wildlife species, numbers and distribution have been slight. The greatest changes have been due to increased human access via motorized roads and trails. Wildlife species inhabiting these communities remain similar to those pre-settlement, with the exception of the grizzly bear; however, populations of some species have varied due to factors other than habitat changes.

Other than low elevation riparian corridors, **Engelmann spruce** communities within the watershed remain relatively unchanged from pre-settlement conditions. These communities, though extremely important to many wildlife species, remain a very minor type in this watershed. Effects of riparian clearing of low elevation stream corridors and valley floors have included the reduction of critical winter range for species such as moose and whitetail deer, greatly reducing beaver habitat and fragmenting migration corridors for neotropical migratory birds. Unaltered upland spruce stands remain

important elk and moose wallow sites, and nesting and foraging sites for thrushes and some warbler species.

Whitebark pine stands, though an important habitat component for many species, were likely never abundant in this watershed. These communities were possibly extensive enough to provide significant seasonal food sources to species such as grizzly bear and black bear. Even though these stands have suffered from fire exclusion, the effects of such changes would not have been great enough to have been a limiting factor in grizzly bear persistence within the watershed. Small local populations of obligate or dependent species, such as Clark's nutcrackers, are still present today but it is not known if these species have been depressed by changes in the whitebark pine communities.

Non-forested alpine plant communities are an extremely minor component of this watershed and are thought to be in essentially the same state today as historically.

Changes to **riparian communities** at lower elevations and along low stream gradients are notable. Several riparian areas within this watershed such as those along lower Deep Cr and within Panther Creek, were subjected to settlement actions such as logging and clearing of valley floors, draining, irrigation diversions and agricultural development. As a result of these activities, the total area occupied by beaver dams and riparian thickets is greatly reduced, as is nesting and foraging habitat for neotropical birds such as yellow warbler and Lincolns sparrow. Removing the deciduous and conifer components of these riparian zones also likely adversely affected key winter range for big game, nesting/foraging habitat for neotropical migratory birds, pileated woodpecker, screech owl, and pacific tree frog.

Snags and down woody debris are much less abundant in managed forests of all types in the east side of the watershed. This is especially true in the low and mid-elevation Douglas-fir forests. Fire exclusion has helped preserve some down woody debris in these communities; however, it has also decreased the rate of snag recruitment in these types. The general result of these changes has been a loss of habitat suitability for many small mammals such as weasel, pine marten, bats, and all primary and secondary cavity-nesting bird species. In forest types such as subalpine fir and lodgepole pine, these changes are much less apparent and have probably been inconsequential from a habitat perspective. The Clear Creek Fire in 2000 served to make additional snags on the west side of the Panther Creek Road within the watershed.

The loss of pre-settlement acreage of **older forest habitat**, primarily in the Douglas-fir communities, has greatly decreased available habitats for dependent or obligate species within this watershed. This is especially true for interior species such as many neotropical bird species and mammals including pine marten and fisher. This magnified effect is the result of fragmentation of older forest areas by roads and timber harvest units which create extensive edge effects. Older forest stands in the subalpine fir communities have been relatively unaffected.

Signs of declining, decadent and dead **aspen** clones are evident throughout the watershed in both forested and nonforested communities. The primary reason for the loss of aspen is past, heavy livestock grazing, fire suppression and the continued impacts of ungulate grazing. Even though livestock utilization rates are much lower now than historically, aspen clones continue to receive disproportionate use because they offer shade, lush forage and/or water. These same attributes are also attractive to native wild ungulates who often contribute to utilization of aspen sprouts, especially on winter ranges. The decrease in aspen stands within the watershed has likely had a significant effect on wildlife habitats and populations of species such as snowshoe hare, beaver, pileated woodpecker and other neotropical migratory birds. This loss has also decreased available browse for big game species, especially moose, elk and deer. In addition, aspen clones also provide abundant forbs and are preferred sites for birthing and rearing of young moose, elk and deer. The loss of habitat and habitat diversity provided by this important vegetative component is disproportionate to the actual acres involved. Restoring this important habitat component should be a high priority in the Middle Panther Creek watershed. In many cases, restoration may simply involve fencing to exclude ungulate grazing and help ensure survival of sprouts. Extremely decadent clones may need felling or burning; but, protective measures may still likely be required.

Very few changes have occurred to **rock features** such as cliffs, spires and talus, within the watershed. Habitat for species such as pika, golden eagle and other raptors, bats and mountain goat has been essentially unchanged since pre-settlement times. The only exceptions to this would be small local intrusions or losses due to interception by road prisms, small scale mining activities or use as borrow sources and/or quarry sites.

Human Uses

Native American use of the Middle Panther Creek Watershed has occurred for more than 10,000 years. Both the Shoshone-Bannock and Nez Perce Tribes consider the Middle Panther Creek Watershed area to be within their aboriginal homeland. Removal of the Lemhi Shoshone to the Lemhi Reservation, and later to the Fort Hall Reservation, reflects Euroamerican demands on land and natural resources. The nomadic and traditional cultural way of life for the tribes was restricted by Euroamerican encroachment and laws. Currently tribal uses associated with the exercise of treaty rights are limited in the watershed. Euroamerican uses and presence are dominant in the watershed. The loss of anadromous fish runs, the reduction in bighorn sheep populations, the distance to reservations and the clash of cultural values have all played a role in limiting Tribal use of the watershed area.

Nez Perce and Shoshone-Bannock cultural identity and livelihood is tied to their aboriginal homeland and its natural and cultural resources. Although the Shoshone-Bannock homeland was ceded to the United States government the tribes reserved the right to hunt and fish, and claim their right to gather on unoccupied lands in the Middle Panther Creek Watershed. Nez Perce treaty rights were established in the Treaty of June 9, 1855 and include the right to hunt, fish and gather on unclaimed lands of the United States.

Factors contributing to a decline in treaty resources, include, but are not limited to, non-Native American competition for big game, livestock diseases that devastated historic herds of bighorn sheep and diminished salmon and steelhead runs due to soil erosion, stream sedimentation, historic mining impacts and downstream dams.

Currently the Shoshone-Bannock and Nez Perce Tribes are especially interested in improving water quality and restoring Chinook salmon and steelhead runs in the Panther Creek drainage. Tribal fisheries biologists are coordinating with State and Federal agencies in this restoration effort. The Tribes have agreed to participate in the oversight of the proposed Idaho Cobalt Project and to provide input to the various State and Federal agencies to improve water quality and re-establish anadromous fish runs in Panther Creek.

The trends for human use in the Middle Panther Creek Watershed have changed overtime. Commodity uses such as mining and commercial timber harvest have declined in the last few decades while non-commodity uses such as recreation have increased. The one commondity use that has increased in the watershed is firewood gathering.

Recreation activities that have increased in recent years including fishing and hunting, mountain biking, camping, and winter sports activities such as cross country skiing and snowmobiling. Off Highway Vehicle (OHV) use has dramatically increased in the watershed since changes in the OHV technology have created more stable, versatile vehicles that are used by a large segment of the public for sightseeing and hunting. Recreation use levels are expected to continue to increase as the population of Idaho and adjacent states continues to rise.

Recommendations:

Soil and Water Resource Recommendations

Blackbird Mine Area

1. Work with the Blackbird Mine Site Group and the operator of the proposed Idaho Cobalt Project to stabilize the Blackbird Creek channel/floodplain and the Blackbird Creek Road. Needed improvements include road narrowing where possible, elevation of the road grade where it is subject to flooding, and stabilization of the toe of the fill slope to prevent channel migration into the road. Install weirs or rock vanes to control the thalweg of Blackbird Creek and prevent it from migrating into the road and to control floodplain elevations. Remove fill material that has been deposited in the floodplain overtime through road maintenance activities, the construction of borrow site turnarounds and the construction of pads for the removal of contaminated sediments along the Blackbird Creek channel.

2. Work with the EPA and other Federal and State agencies to ensure that the long term goals for achieving water quality standards in the South Fork of Big Deer Creek, Big Deer Creek and Panther Creek are met and that aquatic habitat is restored so that all life stages of salmonids may be sustained.

3. Work with Blackbird Mine Site Group and the operator of the proposed Idaho Cobalt Project to reduce road density in the Bucktail Creek drainage and to revegetate, wherever possible, areas disturbed by past or future mining, to restore hillslope processes and reduce surface runoff and soil erosion.

Panther Creek Road

1. Segments of the Panther Creek Road are encroaching on the channel/floodplain of Panther Creek. There is a need to raise the grade of the Panther Creek Road and move the road upslope to reduce channel/floodplain encroachment along segments of the road within the Middle Panther Creek Watershed. The most critical segment is between the Cobalt townsite and Blackbird Creek.

2. There is a need to change the alignment of the Dummy Creek channel immediately above the Panther Creek Road to prevent bedload deposition and channel migration in this location. By straightening a very short reach of Dummy Creek a better approach to the culvert could be achieved. The existing culvert on Dummy Creek is undersized and needs to be replaced with a larger culvert capable of handling a 100 year flood event.

Recommendations: fire ecology

1. **Location of treatments for Wildland Urban Interface:** Treatments for WUI must take into consideration the complete context of fuels in the landscape surrounding the WUI when extreme fire conditions are experienced. It is not logical to assume that creating narrow defensible space around structures or reducing ladder fuels within ¼ to ½ mile from structures will adequately protect them from an uncharacteristic high severity fast moving wildfire. Depending on the width of the flaming front and the WUI width, no reasonable amount of fire suppression crews/equipment could offset such extreme fire behavior without undue risk to personal safety.

2. **Fuels treatment focused only on WUI are not an effective solutions:** For WUI areas located within the path of extreme fire behavior and treated with only "doughnut hole" style defensible space treatments, the high risk from an oncoming extreme fire event would not be effectively mitigated. In such a situation fire suppression crews would be unable to attack this wildfire at the head even if the urban interface buffer areas had been treated for crown fire and fuel risk reduction, because of the mass fire brands raining into the area and fire jumping lines. Mass firebrands would potentially ignite many vulnerable structures causing most of the suppression resources to focus on protecting structures rather than on fire suppression (Hann and Strohm, 2002).

3. **Landscape focus for reducing risk to WUI:** Dr. Hann suggests an excellent approach to reducing wildfire risk to WUI areas. Most of the following discussion has been adapted from Hann and Strohm, 2002.

There is a landscape design fuels treatment option that can reduce wildfire risk to WUI and have the added benefit of reducing risk to ecosystems at landscape scales. This type of design would involve treatment and maintenance to achieve the condition class 1 landscape objective across a watershed to change large wildfire behavior and effects. Essentially focusing on treatment of high departure polygons throughout the watersheds in a pattern most effective at changing large wildfire behavior and effects (Hann and Bunnell 2001). The first set of treated polygons would focus on mechanical and prescribed fire treatment of operationally accessible high departure polygons and maintenance of low departure polygons that are in the zone of wildfire influence to the WUI areas (Hann and Strohm, 2002).

The second set of treatments would tie in the intermingled less operationally accessible high departure polygons through use of hand cutting and prescribed fire by being able to anchor into the first set of treatments. In addition, prescribed fire with minimal mechanical or hand treatment could be used at the higher elevations and in areas where fuel breaks (natural or human made) currently exist and in the roadless areas, to reduce the potential for uncharacteristic fire spreading from or to that area. In addition, the design could take into account ecosystem objectives for reducing risks to air, water,

native species habitats, and sustainability; in essence achieving risk reduction for multiple benefits at the same cost (Hann and Strohm, 2002).

This landscape approach to treatment would substantially change the behavior and effects of a large wildfire run originating from within the Middle Panther Creek watersheds or from adjacent landscapes. Wildfire from any of these sources would still spread fairly rapidly in grass and shrub surface fuels, but would have low risk of torching and spotting and little risk of sustaining a running crown fire. Initial attack would have a much higher chance of containing the fire and if the fire escaped initial attack then suppression efforts could contain the fire using retardant lines or hand or dozer lines anchored across strategic areas. There would be little spotting into urban interface structures, thus reducing risk to both vulnerable and non-vulnerable structures. It is reminded that the vulnerability of structures primarily exists within the narrow zone of the structure and surrounding area that typically is in the ownership of the structure owner (Finney and Cohen 2002). However, by substantially reducing firebrands and changing fire behavior from crown to surface, the risk even to vulnerable structures becomes less.

We have generally found that even in communities with high awareness of wildfire risks and ability of structure owners to reduce these risks with mitigation of structure vulnerability and fuel management, there is at best only about half of the structure owners that will take action. This type of wildfire behavior could be managed within the availability of typical suppression resources without having to redirect most of the resources to protection of structures.

Location of treatments for ecosystem condition class 2 & 3 restoration: One of the first steps for identifying priority treatment locations will be to identify the overlap of the FRCC high abundance and FRCC high risk for sustainability layers. Then these locations for treatment should be evaluated in light of reducing WUI risk, reducing risk of losing ecosystem components, sustaining T&E habitat, and cost effectiveness. Other factors will need to be considered.

Location of treatments for ecosystem condition class maintenance: Reducing fire severity: Pollet and Omi studied the effects of wildfire on forest stands that had a variety of fuel treatments before the stands were burned by a wildfire. Pollet and Omi studied fuels treatment that included prescribed broadcast burning, thinning and under burning, and whole tree removal and concluded that fire severity and crown scorch were significantly lower in the treated stands (Pollet 2002, page 2). In the Middle Panther Creek watershed we have used forest structural stages to address forest structural characteristics (e.g. crown closure, tree diameters, and the relative vertical/spatial arrangement of trees) (Hessburg 1999, pg 46-47). Fewer trees/acre will result in less continuous crowns and ladder fuels. Also, larger Douglas-fir trees will have thicker bark which increases fire resistance, and will generally have live branches higher above the ground. Fuels treatment activities can provide an increase in fire resistance characteristics. Pollet and Omi found “the benefits of treated stands are lower potential for crown fire initiation and propagation and less severe fire effects” (Pollet and Omi, 2002, pg 8).

It has been suggested that opening forests may result in a drier microclimate compared to a closed stand (ground fuels are more exposed to wind and solar heat), and more severe fires may result. Graham addressed this topic and stated (Graham et al 1999, pg 18):

Thinnings in general will lower crown bulk densities and redistribute fuel loads significantly, thus decreasing fire intensities ***if the surface fuels are treated*** *(Agee 1993, Alexander 1988, Alexander and Yancik 1977). These removals have been shown to be effective in reducing crown fire potential, especially around homes (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988).*

Because of drier fuels (fuels are more exposed to wind and heat) and increased wind speeds that occur in thinned stands, it is critical that they be treated to minimize fire intensity. In California, plantations where surface fuels were treated had substantially less damage from wildfires compared to untreated plantations that burned completely and severely (Weatherspoon and Skinner 1995).

Regarding opening up forested stands, Pollet and Omi found in their study of four wildfire locations that had burned-over fuels treatment areas, the more open stands (treated) had significantly lower fire severity impacts compared to the more densely stocked untreated stands. They stated," *removing small diameter trees from a ponderosa pine stand reduced subsequent wildfire severity. At the four sites, the fuel reduction overcomes any microclimate effects on fire behavior resulting from a more open stand*." (Pollet 2002, pg 8).

Thinning smaller trees and understory trees as a tool to reduce fire severity: Benefits of fuels treatment: After a study of four wildfire locations, Pollet and Omi stated, "based on statistical results and field reconnaissance, sites with mechanical fuel treatment appeared to have more dramatically reduced fire severity compared to the site with prescribed fire only" (Pollet 2002, pg 6). After an in-depth research in to a wide range of thinning methods, Graham made the following statements (Graham et al 1999, page 20):

Fire intensity in thinned stands is greatly reduced if thinning is accompanied by reducing the surface fuels created by the cutting…. Thinning and other thinning-like stand treatments can substantially influence subsequent fire behavior at the stand level by either increasing or decreasing fire intensity and associated severity of effects. Depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species. Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables.

Thinning from below will have a direct effect on the height of live limbs that may become available fuel for fires in high fire danger situations. These live lower limbs are

the fuels (ladder fuels) that allow fire to climb into the forest canopy and result in high severity crown fires.

Omi and Martinson found that crown bulk density was not the variable that had the strongest correlation to fire severity, based on their study of wildfire effects; it was height to live crown that had the strongest correlation to fire severity (Omi 2002, pg 20). Stand density and height to live crowns can be greatly modified by thinning-from-below treatments. It is the height to live crown that determines crown fire initiation rather than crown fire propagation (Omi 2002, pg 22). Scott and Reinhardt stated that thinning designed to reduce crown fire hazard will usually raise the effective canopy base height (CBH) which is a function of the amount and height of lower live limbs on the trees in a stand (Scott 2001, page 31).

Reducing upper level crown fuels: The ladder fuel profile is important in the context of crown fire initiation, propagation, and crown fire spread. When considering multistoried stands, the higher up into the ladder fuel profile where dense canopies can be treated to open the stand, the greater the opportunity to reduce the risk of crown fire. Maximum reduction in crown fire risk will be accomplished by treating the entire ladder fuel profile (Omi 2002, pg 23; Fiedler 2001, pg 17). Stand density and basal area were found to be important descriptors of fire severity, the lower the basal area and the lower the stand density, the lower the fire severity indicators (Pollet 2002).

Recommendations -- Fish

1. Continue to develop and implement management strategies within the Middle Panther Creek Watershed which will improve aquatic habitat quality.

2. Develop and implement habitat improvement projects within the watershed to reduce sediment inputs to tributary and mainstem waters, restore impaired migratory access within the Deep and Woodtick Creek drainages, and increase large woody debris loading and improve pool frequency and quality within reaches of mainstem Panther Creek.

3. Assist other Federal and State agencies in ongoing water quality and aquatic/riparian restoration efforts and strategies within areas impacted by past mining activities.

4. Continue to refine and monitor grazing strategies in areas of the watershed within the Williams-Napias and Deer-Iron allotments to improve stream and riparian habitat conditions and ensure avoidance of direct impacts to spawning bull trout and their incubating eggs.

5. Support and promote continuing Idaho Department of Fish and Game Department efforts to restore anadromous fisheries resources within the Panther Creek

drainage through active reintroductions of juvenile and adult Chinook salmon and steelhead.

6. Support developing Shoshone-Bannock and/or Nez Perce Tribal efforts to improve habitat conditions and restore anadromous fisheries resources within the Panther Creek drainage.

Wildlife Resource Recommendations

Terrestrial wildlife

1. Complete an aspen inventory throughout watershed. Regenerate or release all living aspen clones that do not have adequate sprouts or advanced regeneration, as noted during inventory. Consider protection measures to ensure perpetuation of aspen from ungulate grazing.

2. Evaluate deciduous component of riparian areas for restoration opportunities.

3. Use prescribed fire and/or timber harvest to regenerate or release decadent whitebark pine stands.

4. Require all future vegetative management activities to retain islands of snags and snag replacement trees. Maintain snags along and within riparian areas. Enforce current fuelwood cutting restrictions of 300 ft from streams, especially along Panther Creek, except for identified and marked hazard trees.

5. Initiate seasonal and/or yearlong motorized road and trail use restrictions where resource conflicts exist. Ensure proposed restrictions are compatible with the on-going Travel Planning and OHV Route Designation effort (September 2008). Restrictions designed to reduce disturbance to big game during the reproductive period and during hunting seasons will be most beneficial to wildlife.

6. Complete noxious weed inventory; prioritize chemical treatments according to introduction of and risk of spread of new invaders and established target species especially on winter range; use biological agents where appropriate.

7. Use prescribed fire to reduce conifer encroachment and maintain the sagebrush/bunchgrass communities. Emphasize treatments that provide for differing age classes to enhance vegetative diversity. Consider leaving a minimum of 100 yards of unburned buffer along all conifer/sagebrush ecotones when using prescribed fire.

8. Evaluate big game winter range for appropriate restoration opportunities.

Recommendations -- Human Uses

1. Develop and maintain a Government-to-Government relationship with the Shoshone-Bannock and Nez Perce Tribes. Consult with them on a consistent basis regarding environmental analysis for projects and decisions that have the potential to affect the exercise of their treaty rights as well as treaty and cultural resources in the Middle Panther Creek Watershed (and elsewhere within ceded lands contained within the Salmon-Challis National Forest)

2. Consult with Tribes during the initial stages of environmental analysis to identify critical management needs that meet tribal and agency watershed restoration objectives. Consult during initial stages of environmental analysis on other project proposals identified as a result of the Middle Panther Creek Watershed analysis. Solicit input regarding the Tribes interests and knowledge of the area; share inventory, monitoring and other scientific data.

3. Establish partnerships and agreements with Tribes to meet mutual watershed restoration goals.

4. Manage the Middle Panther Creek Watershed to eradicate non-native plant species and noxious weeds in an effort to increase opportunities for the reestablishment of native species. Design projects that enhance riparian and wildlife habitats that are critical for the perpetuation of treaty resources and ecosystem health.

5. Continue to implement Forest Plan direction to encourage the legitimate exploration and extraction of lease-able and locatable minerals from National Forest lands while maintaining or improving other resource values.

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Fisheries Appendix A
Population Status of Listed and Sensitive fish species within the Middle Panther Creek Watershed, by Subwatershed

Woodtick Creek Subwatershed

The bull trout population is relatively strong throughout the Woodtick Subwatershed compared to the rest of the Panther Creek drainage. While Woodtick Creek has marginal habitat for adult anadromous fish, juvenile fish have access to lower reaches of the stream and juvenile rainbow/steelhead trout are known to utilize these areas.

Panther–Copper Subwatershed

A few larger bull trout (300 mm +) are observed annually along main Panther Creek during IDFG snorkel surveys. Chinook salmon have been observed spawning in Panther Creek from Blackbird to Moyer Creeks Creeks in recent years. This reach is also occupied by rainbow trout, some of which might be juvenile steelhead. Only westslope cutthroat trout have been documented in Copper Creek although it is likely that juvenile anadromous fish may also use lower the reaches. All other tributary streams of the watershed are barren of fish.

Blackbird Creek Subwatershed

Main Blackbird Creek between the mouth and Meadow Creek is barren of all species because of past mining activities. Low numbers of bull trout occupy the West Fork of Blackbird Creek above the waste rock dump No bull trout occupy the headwaters of Blackbird Creek above Meadow Creek.

Juvenile anadromous fish probably occupied lower reaches of Blackbird Creek prior to mining, and appear to be repopulating the lower reaches of the drainage, at least seasonally in recent years, as rainbow trout and chinook salmon were collected in the lower 100 yards of Blackbird Creek in 2001 by a firm representing the mine.

Panther-Fawn Subwatershed

A few larger bull trout (300 mm +) are observed annually along main Panther Creek during IDFG snorkel surveys. Fewer bull trout are observed downstream of the mouth of Blackbird Creek as compared to above in the Panther – Copper subwatershed.
It is unknown if some rainbow trout in Panther Creek are actually steelhead.

Historically, Panther Creek had chinook and steelhead habitat. Adult salmon were seen spawning in Panther Creek above Napias Creek in recent years. Previously, no fish had been observed there for several decades. The other tributary streams of the watershed, including Spring, Fawn and Cliff Creeks are barren of fish.

Deep Creek Subwatershed

Bull trout populations are relatively strong throughout the subwatershed as compared to the rest of the Panther Creek drainage. Deep Creek, to a point near the mouth of Little Deep Creek, is thought to have had habitat for steelhead trout and chinook salmon No Chinook were observed in lower Deep Creek following IDFG outplants in 2001, however the stream is occupied by rainbow and/or steelhead trout juveniles. Steelhead have not been ovbserved spawning in the subwatershed in recent years. Juvenile anadromous fish have access to lower Little Deep Creek, but the stream has only marginal habitat for adult anadromous fish, and only westslope cutthroat trout and brook trout have been observed.

Panther-Little Deer Subwatershed

A few larger bull trout (300 mm +) are observed annually along main Panther Creek during IDFG snorkel surveys. Fewer bull trout are observed downstream of the mouth of Blackbird Creek as compared to above in the Panther – Copper subwatershed. No bull trout have been observed in Little Deer Creek, Big Jureano Creek, and Little Jureano Creek, or Quartz Gulch. Chinook salmon have been observed spawning in Panther Creek above and below Napias Creek in recent years. Prior to the outplant of adult Chinook in 2001, no fish had been observed in this reach for several decades. Juvenile Chinook were observed in the lowest reaches of Little Deer Creek in 2002. Remaining triburary streams of the Watershed, including Big Jureano Creek, and Little Jureano Creek and Quartz Gulch, are believed to be barren of fish.

Big Deer Creek Subwatershed

Until recently, lower Big Deer Creek was barren of all species below South Fork Big Deer Creek because of past mining activities in the South Fork drainage. Following recent cleanup actions, a few trout are starting to reoccupy Big Deer Creek below the South Fork. No bull trout have been observed in the Big Deer Creek drainage, however.

A series of barrier cascades located bout 3/8 mile above the mouth of Big Deer Creek limit migration opportunities within the drainge. Although minimal spawning habitat is available in the lower reaches of the stream, improved water quality in recent years may be providing for renewed utilization by juvenile anadromous and resident fish, as juvenile rainbow/steelhead, as well as westlope cutthroat trout have recently been documented in the lower reaches of the stream. No fish occupy the South Fork of Big Deer Creek below the confluence of Bucktail Creek due to water quality impacts from past mining activities.

Fisheries Appendix B
Matrix of Pathways and Indicators for Aqauatic Habitat Elements within the Middle Panther Creek Watershed.

PATHWAYS		FUNCTIONAL CONDITION		
INDICATORS		FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Water Quality				
Temp.	INFISH	Deep Cr, Woodtick Cr		X
	PACFISH	Big Deer Cr, Deep Cr, Woodtick Cr	Panther Cr, Blackbird Cr	
Sediment		Deep Cr, Woodtick Cr Little Deer Cr 1/	Big Deer Cr, Panther Cr	Blackbird Cr, Little Deep Cr
Chemical Contaminants/ Nutrients		Deep Cr, Woodtick Cr Little Deer Cr 1/		Panther Cr, Big Deer Cr, Blackbird Cr
Habitat Access				
Physical Barriers		Deep Cr	X	
Habitat Elements				
Substrate Embeddedness				
Large Woody Debris		Woodtick Cr	X	
Pool Frequency & Quality		Woodtick Cr, Big Deer Cr	Panther Cr, Deep Cr	Blackbird Cr Little Deer Cr 1/
Off-channel Habitat		Woodtick Cr, Big Deer Cr		X
Refugia			X	
Channel Condition & Dynamics				
Width/Depth Ratio		Deep Cr, Woodtick Cr, Big Deer Cr, Panther Cr above Blackbird Cr	Panther below Blackbird Cr, Blackbird Cr	Little Deer Cr 1/
Streambank Condition		X	Panther Cr above Blackbird Cr	Blackbird Cr.
Floodplain Connectivity		X	Panther Cr, Blackbird Cr	
Flow/Hydrology				
Change in Peak/Base Flows		Deep Cr and Woodtick Cr watersheds	X	
Increase in Drainage Networks		X		

PATHWAYS	FUNCTIONAL CONDITION		
INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
Watershed Conditions			
Road Density & Location		X	Panther Cr, Copper Cr, Blackbird Cr Bucktail Cr
Disturbance History		Deep Cr and Woodtick Cr watersheds	X
Riparian Conservation Areas	X	Little Deep Cr, Copper Cr, Panther Cr Little Deer Cr 1/	Blackbird Cr
Disturbance Regime		X	
Integration of Species & Habitat Conditions			
Habitat Quality & Connectivity		Deep Cr, Woodtick Cr, Panther Cr above Blackbird Cr, Little Deer Cr 1/	Panther Cr below Blackbird Cr, Blackbird Cr, Big Deer Cr

Source: USDA Forest Service, 2005, modified to update. Except 1/ Kuzis, 2004 (Little Deer Creek)

Wildlife Appendix A Habitats available for species of special status in the Middle Panther Cr Watershed Analysis Area.

Terrestrial Habitats								
	Sagebrush/ grassland	Low elev. Dry Forest	Mesic mxd Forest	High elev. Moist Forest	Talus	Rock/Cliff	Non-native structure	Riparian
Habitat component								
General						Spotted bat	Spotted bat	Spotted bat
						W Big-eared bat	W Big-eared bat	W Big-eared bat
	Gray wolf	Gray wolf	Gray wolf	Gray wolf				Gray wolf
			Wolverine	Wolverine	Wolverine			
			Fisher	Fisher				
	Sage grouse	Sage grouse						
	Lemhi penstemon	Lemhi penstemon						
						Peregrine falcon		Peregrine falcon
								Bald eagle
								Harlequin Duck
								Columbia spotted frog
Snags		Pileated Woodpecker	Pileated Woodpecker					Pileated Woodpecker
		Flammulated owl	Flammulated owl					
		Spotted bat						Spotted bat
		W Big-eared bat	W Big-eared bat	W Big-eared bat				W Big-eared bat
			Great gray owl	Great gray owl				
				Boreal owl				
			Fisher	Fisher				
			3-toed woodpecker	3-toed woodpecker				

* - species of special status include those listed as threatened, endangered, sensitive, or management indicator species.

Wildlife Appendix A Habitats available for species of special status in the Middle Panther Cr Watershed Analysis Area.

Terrestrial Habitats								
	Sagebrush/ grassland	Low elev. Dry Forest	Mesic mxd Forest	High elev. Moist Forest	Talus	Rock/Cliff	Non-native structure	Riparian
Habitat component								
Old Growth		Pileated Woodpecker	Pileated Woodpecker					Pileated Woodpecker
			Fisher	Fisher				Fisher
			Northern goshawk					
				Boreal owl				
				Canada lynx				
		Spotted bat						
		W Big-eared bat						
Down/woody		Pileated Woodpecker	Pileated Woodpecker					Pileated Woodpecker
			Fisher	Fisher				Fisher
Aspen/meadow		Pileated Woodpecker	Pileated Woodpecker					Pileated Woodpecker
		Northern goshawk	Northern goshawk					
			Great gray owl					
				Wolverine				
								Pink agoseris

* - species of special status include those listed as threatened, endangered, sensitive, or management indicator species.

Forested Vegetation Appendix A. Forested Structural Stage Descriptions (taken from PNW-GTR-385, 1996)

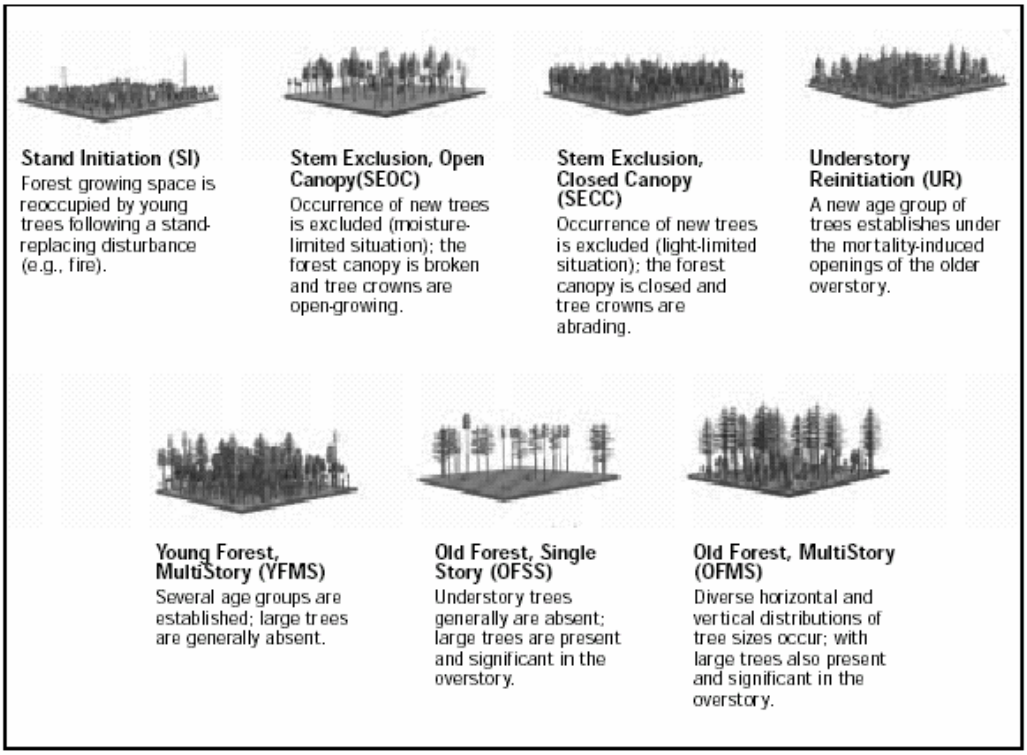


Figure 7—Structural Stage Definitions.

Table 3—Structural stages often used to describe changes in forest vegetation structure over time.

Structural Stage	Definition	Also Referred to As:
Stand initiation	When land is reoccupied by trees following a stand-replacing disturbance.	Early-successional Early-seral Regeneration
Stem exclusion-open canopy	Forested areas where the occurrence of new trees is predominantly limited by moisture.	Mid-successional Mid-seral Young forest
Stem exclusion-closed canopy	Forested areas where the occurrence of new trees is predominantly limited by light.	Mid-successional Mid-seral Young forest
Understory reinitiation	When a second generation of trees is established under an older, typically seral, overstory.	Mid-successional Mid-seral Young forest
Young forest multi-story	Stand development resulting from frequent harvest or lethal disturbance to the overstory.	Mid-successional Mid-seral Young forest
Old multi-story	Forested areas lacking frequent disturbance to understory vegetation.	Late-successional multi-story Late-seral multi-story Old forest multi-story
Old single-story	Forested areas resulting from frequent non-lethal prescribed or natural underburning, or other management	Late-successional single-story Late-seral single-story Old forest single-story

Forested Vegetation Appendix B natural (historical) composition and fire frequency and severity.

PVT	Fire Regime Group	A		B		C		D		E		All Natural Fire		Surface or Mosaic Fire		Stand Replacement Fire	
Name		Name	%	Name	%	Name	%	Name	%	Name	%	Prob	Frq (yrs)	Prob	%	Prob	%
Wyoming Big Sage-Threetip PVT 109,118	III – Infrequent Mixed	Grass-forb	**20**	Closed young sage-open grass/forb	**05**	Open young sage-closed grass/forb	**20**	Open mature sage-closed grass/forb	**50**	Closed mature sage-open grass/forb	**05**	.025	**40**	.01	40	.015	**60**
Mt. Big Sage PVT 112	I – Frequent Mixed	Grass-forb	**15**	Closed young sage-open grass/forb	**20**	Open young sage-closed grass/forb	**30**	Open mature sage-closed grass/forb	**15**	Closed mature sage-open grass/forb	**20**	.04	**25**	.014	30	.026	**65**
Mt. Mahogany PVT 121	IV – Infrequent Replace-ment	Grass-forb	**10**	Closed young shrub-open grass/forb	**10**	Open young shrub-closed grass/forb	**20**	Open mature shrub-closed grass/forb	**40**	Closed mature shrub-open grass/forb	**20**	.02	**50**	.004	20	.016	**80**
Mt. Big Sage/ with conifer PVT 113	I - Frequent Mixed	Grass- forb; Early devmt Scattered snags, down logs	**20**	Closed Sage/ open grass; 50% w/ scattered Snags & down logs – mature, pole, & sapling	**30**	Open Sage/closed grass; open mixed conifers; some mt. Mahogany & mt. shrubs	**35**	Open pole-sapling/ mature sage/ grass; some mt. Mahogany & mt. shrubs	**10**	Closed Conifer/ litter-duff; some grass and open sage/shrubs	**5**	.04	**25**	.02	50	.02	**50**
Dry Douglas-fir with ponderosa pine (+ ponderosa pine grassland) PVT 53, 133	I – Frequent Surface	Shrub-Grass-forb; 50% w/ no snags; 50% w/ scattered large snags – more pole, & sapling snags	**20**	Closed pole-sap /shrub/ litter-duff; scattered large snags –more pole & sapling snags; 90% ponderosa pine-Doug-fir; 10% aspen	**10**	Open pole-sapling/ shrub-grass; 80% w/ no snags-down logs; 20% with pole & sapling snags & down logs; 100% ponderosa pine-Doug-fir	**20**	Open large tree/shrub-grass; 80% w/ no snags-down logs; 20% w/ large snags-down logs; 100% ponderosa pine-Doug-fir	**40**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 100% ponderosa pine-Doug-fir	**10**	.04	**25**	.03		.01	**25**
Dry Douglas-fir with no ponderosa pine (+ Douglas-fir grassland + aspen/ conifer) PVT 54, 132, 120	I – Frequent Mixed	Shrub-Grass-forb; 50% w/ no snags; 50% w/ scattered large snags – more pole, & sapling snags	**20**	Closed pole-sap /shrub/ litter-duff; scattered large snags –more pole & sapling snags; 80% Doug-fir; 20% aspen	**10**	Open pole-sapling/ shrub-grass; 80% w/ no snags-down logs; 20% with pole & sapling snags & down logs; 100% Doug-fir	**20**	Open large tree/shrub-grass; 80% w/ no snags-down logs; 20% w/ large snags-down logs; 100% Doug-fir	**40**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 100% Doug-fir	**10**	.033	**30**	.023	70	.01	**30**

PVT	Fire Regime Group	A		B		C		D		E		All Natural Fire		Surface or Mosaic Fire		Stand Replacement Fire	
Name		Name	%	Name	%	Name	%	Name	%	Name	%	Prob	Frq (yrs)	Prob	%	Prob	%
Douglas-fir-lodgepole ≤ 30% slope PVT 74	III – Infre-quent Mixed	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – mature, pole, & sapling	**15**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 60% lodgepole-20% Doug-fir; 20% aspen	**25**	Open pole-sapling/ shrub-grass; 60% w/ no snags-down logs; 40% with pole & sapling snags & down logs; 60% lodgepole-30% Doug-fir; 10% aspen	**40**	Open large tree/shrub-grass; 80% w/ no snags-down logs; 20% w/ large snags-down logs; 70% lodgepole-30% Doug-fir	**15**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 20% lodgepole-70% Doug-fir; 10% aspen	**5**	.025	**40**	.018	70	.007	**30**
Douglas-fir-lodgepole > 30% slope PVT 75	IV – Infre-quent Replace-ment	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – pole & sapling	**30**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 60% lodgepole-20% Doug-fir; 20% aspen	**35**	Open pole-sapling/ shrub-grass; 60% w/ few snags-down logs; 40% with pole & sapling snags & down logs; 60% lodgepole-30% Doug-fir; 10% aspen	**20**	Open large tree/shrub-grass; 80% w/ few snags-down logs; 20% w/ large snags-down logs; 30% lodgepole-70% Doug-fir	**10**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 20% lodgepole-70% Doug-fir; 10% aspen	**5**	.025	**40**	.006	25	.019	**75**
Subalpine fir dry ≤ 30% slope PVT 66	III – Infre-quent Mixed	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – mature, pole, & sapling	**10**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 40% lodgepole-20% Doug-fir; 20% spruce; 20% aspen	**35**	Open pole-sapling/ shrub-grass; 60% w/ no snags-down logs; 40% with pole & sapling snags & down logs; 80% lodgepole-20% Doug-fir	**40**	Open large tree/shrub-grass; 80% w/ no snags-down logs; 20% w/ large snags-down logs; 70% lodgepole-30% Doug-fir	**5**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 40% lodgepole-30% Doug-fir; 30% spruce	**10**	.02	**50**	.012	60	.008	**40**
Subalpine fir dry > 30% slope PVT 68	IV – Infre-quent Replace-ment	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – pole & sapling	**25**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 40% lodgepole 20% Doug-fir 20% spruce; 20% aspen	**40**	Open pole-sapling/ shrub-grass; 60% w/ few snags-down logs; 40% with pole & sapling snags & down logs; 80% lodgepole 20% Doug-fir	**10**	Open large tree/shrub-grass; 80% w/ few snags-down logs; 20% w/ large snags-down logs; 20% lodgepole-80% Doug-fir	**5**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 20% lodgepole-20% Doug-fir; 60% spruce	**20**	.02	**50**	.003	15	.0`7	**85**

PVT	Fire Regime Group	A		B		C		D		E		All Natural Fire		Surface or Mosaic Fire		Stand Replacement Fire	
Name		Name	%	Name	%	Name	%	Name	%	Name	%	Prob	Frq (yrs)	Prob	%	Prob	%
Subalpine fir moist PVT 69	IV – Infre-quent Replace-ment	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – pole & sapling	**15**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 30% lodgepole 20% Doug-fir 40% spruce; 10% aspen	**45**	Open pole-sapling/ shrub-grass; 60% w/ few snags-down logs; 40% with pole & sapling snags & down logs; 90% lodgepole 10% Doug-fir	**10**	Open large tree/shrub-grass; 80% w/ few snags-down logs; 20% w/ large snags-down logs; 10% lodgepole-90% Doug-fir	**5**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 10% lodgepole-10% Doug-fir; 80% spruce	**25**	.015	**70**	.004	25	.011	**75**
Subalpine fir-whitebark pine (+ whitebark pine-subalpine fir) PVT 71, 70	IV – Infre-quent Mixed	Shrub-grass-forb-tree seedling; 20% w/ no snags; 80% w/ scattered snags – pole & sapling	**20**	Closed pole-sapling/ shrub/ litter-duff; scattered pole snags –more sapling snags; 30% lodgepole 40% whitebark 20% spruce 10% subalpine	**20**	Open pole-sapling/ shrub-grass; 60% w/ few snags-down logs; 40% with pole & sapling snags & down logs; 30% lodgepole 20% whitebark 30% spruce 20% subalpine	**30**	Open large tree/shrub-grass; 80% w/ few snags-down logs; 20% w/ large snags-down logs; 50% lodgepole-50% whitebark	**15**	Closed large-pole-sapling tree/ shrub litter-duff; large snags & down logs; 80% spruce 20% subalpine	**15**	.016	**60**	.006	35	.01	**65**
Riparian shrub-herb (riparian herb + riparian shrub) PVT 119, 124	IV- Infre-quent Mixed	Sedge-grass-forb-shrub sprouts	**10**	Young shrubs/ sedge-grass-forb	**45**	Young shrubs/ sedge-grass-forb	**20**	Old shrubs/sedge-grass	**5**	Old shrubs/sedge-grass	**20**	.013	**75**	.007	55	..006	**45**
Riparian cottonwood PVT 110	IV – Infre-quent Mixed	Sedge-grass-forb-cottonwood-aspen sprouts/ shrub sprouts; scattered residual large cottonwood-aspen	**5**	Pole-sap cottonwood-aspen/ young shrubs/ sedge-grass-forb	**45**	Pole-sap cottonwood-aspen/ young shrubs/ sedge-grass-forb	**10**	Mature cottonwood-aspen/ old shrubs / sedge-grass	**5**	Mature cottonwood-aspen/ old shrubs / sedge-grass	**35**	.015	**65**	.010	65	.005	**35**
Irrigated Pasture																	
Rock																	
Water																	

Closed shrub = > 15% line intercept canopy cover; open shrub = ≤ 15% line intercept canopy cover
Closed forest = > 40% canopy cover; open forest = ≤ 40% canopy cover
Young shrub – y-shaped growth form, grass around base rather than litter, lack of dead material accumulation in crown
Mature shrub – mushroom shaped growth form, litter & scattered grass around base, dead material accumulation in crown.

Box Model Discussion

Columns A through E refer to seral stages or classes within the box model diagram.

Box A: Early seral. Structural stages include stand initiation (si), open herbland (oh), and closed herbland (ch).
Box B: Mid seral closed. Structural stages include stem exclusion closed canopy (secc), understory reinitiation (ur), young forest multi-strata (yfms), closed tall shrub (cts), closed mid shrub (cms), closed low shrub (cls). Shrubs are young in age.
Box C: Mid seral open. Structural stages include stem exclusion open canopy (seoc), open mid shrub (oms), open low shrub (ols), open tall shrub (ots). Shrubs are young in age.
Box D: Late seral open. Structural stages include old forest single strata (ofss), open tall shrub (ots), open mid shrub (oms), open low shrub (ols), open tall shrub (ots). Shrubs are mature in age.
Box E: Late seral closed. Structural stages include old forest multi strata (ofms), closed tall shrub (cts), closed mid shrub (cms), closed low shrub (cls). Shrubs are mature in age.

Fire Probability and Frequency

The six columns on the far right of the table describe the statistical modeling from the VDDT. It shows the frequency (in years) of a natural fire occurring and the distribution (in % area) between a mosaic (fatal and non-fatal) fire and a stand replacing fire.

Forested Vegetation Appendix C. Fire Regime Condition Class (FRCC) Attribute Definitions

Fire Regime

Natural (historical) fire regime groups from Hardy et al. (2001) and Schmidt et al. (2002) as interpreted by the author for modeling landscape dynamics at project and watershed scales.

Fire Regime Group	Frequency (Fire Return Interval)	Severity	Modeling Assumptions
I	0 – 35+ years, Frequent	Surface	Open forest or savannah structures maintained by frequent fire; also includes frequent mixed severity fires that create a mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches (generally < 40 hectares (100 acres)). Interval can range up to 50.
II	0 – 35+ years, Frequent	Replace-ment	Shrub or grasslands maintained or cycled by frequent fire; fires kill non-sprouting shrubs such as sagebrush which typically regenerate and become dominant within 10-15 years; fires remove tops of sprouting shrubs such as mesquite and chaparral, which typically resprout and dominate within 5 years; fires typically kill most tree regeneration such as juniper, pinyon pine, ponderosa pine, Douglas-fir, or lodgepole pine. Interval can range up to 50.
III	35 – 100+ years, Infrequent	Mixed	Mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches (generally < 40 hectares (100 acres)) maintained or cycled by infrequent fire. Interval can range up to 200.
IV	35 – 100+ years, Less Infrequent	Replace-ment	Large patches (generally > 40 hectares (100 acres)) of similar age post-fire shrub or herb dominated structures, or early to mid-seral forest cycled by infrequent fire. Interval can range up to 200.
V	> 100-200 years, Rare	Replace-ment	Large patches (generally > 40 hectares (100 acres)) of similar age post-fire shrub or herb dominated structures, or early to mid to late seral forest cycled by infrequent fire.

Fire Regime Condition Class

Condition Classes from Hardy et al. (2001) and Schmidt et al. (2002) as interpreted by the author for modeling landscape dynamics and departure from historical (natural) range of variability at project and watershed scales. Historical Range of Variability (HRV) is the variability of regional or landscape composition, structure, and disturbances, during a period of time of several cycles of the common disturbance intervals, and similar environmental gradients, referring, for the United States, to a period prior to extensive agricultural or industrial development. Natural Range of Variability (NRV) - the ecological conditions and processes within a specified area, period of time, and climate, and the variation in these conditions that would occur without substantial influence from mechanized equipment (synthesized from Hann and others 1997a, Landres and others 1999, Morgan and others 1994, Swetnam and others 1999, Swanson and others 1994).

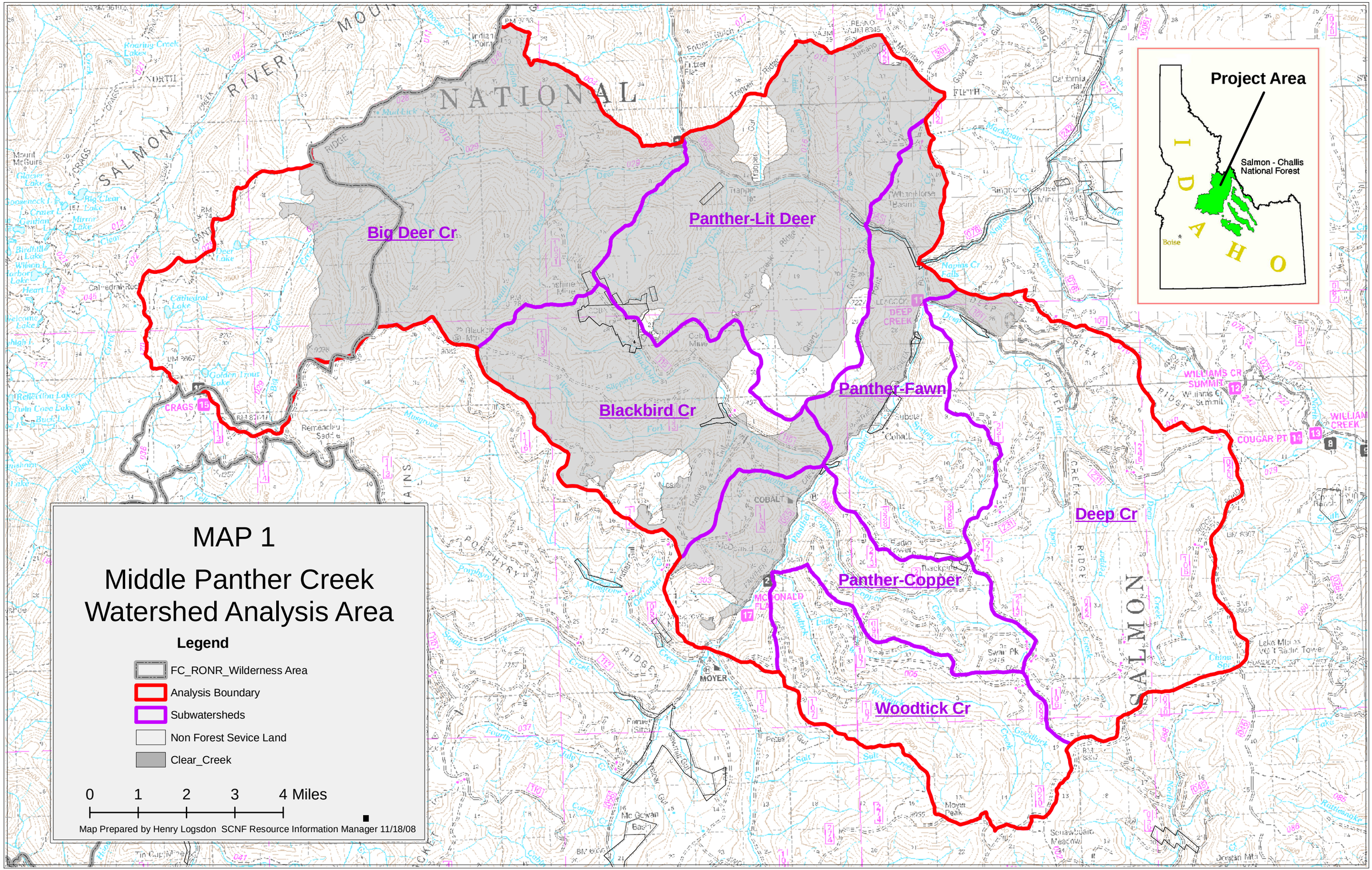
Class	NRV or HRV Departure	Description
Condition Class 1	None, Minimal, Low	Vegetation composition, structure, and fuels are similar to those of the historic regime and do not pre-dispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the historical fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the historical range of variability. Smoke production potential is low in volume.
Condition Class 2	Moderate	Vegetation composition, structure, and fuels have moderate departure from the historic regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the historical fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the historical range of variability. Smoke production potential has increased moderately in volume and duration.
Condition Class 3	High	Vegetation composition, structure, and fuels have high departure from the historic regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the historical fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the historical range of variability. Smoke production potential has increased with risks of high volume production of long duration.

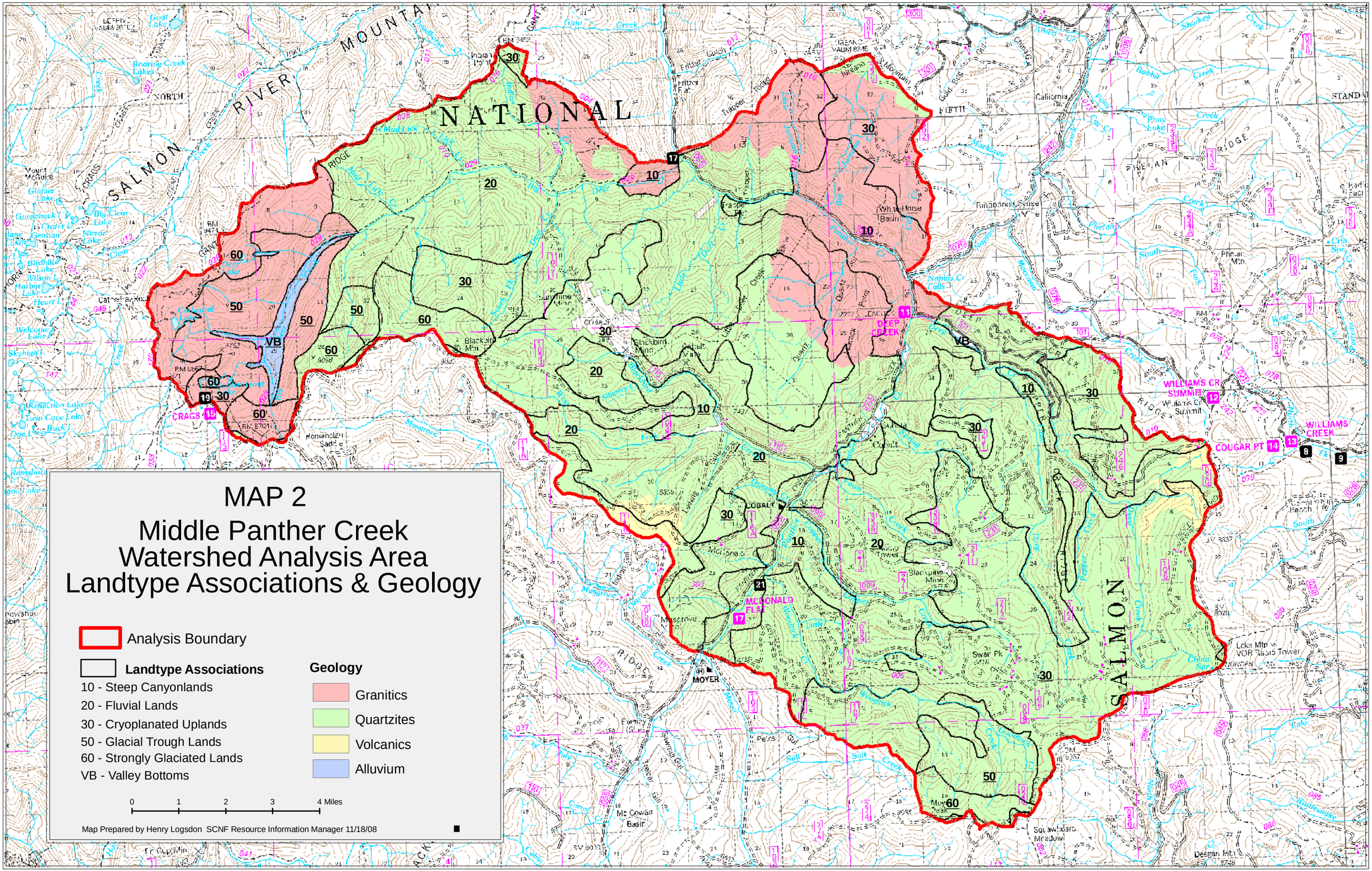
FRCC Sustainability Risk

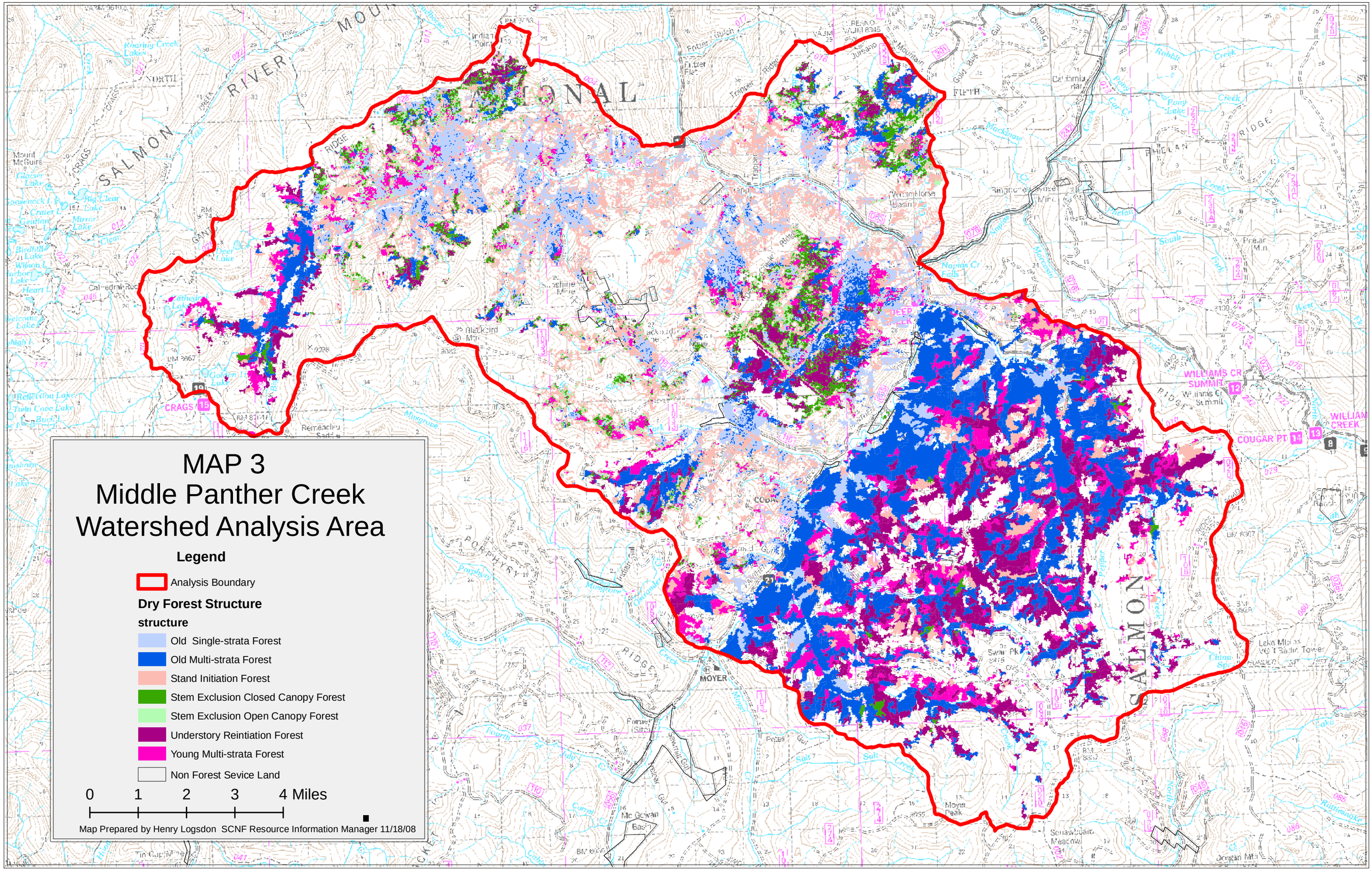
Class	NRV or HRV Departure	Description
Low	< ± 25% of Natural Regime	Patch or stand vegetation composition, structure, fuels, snags, down logs, and ground cover are similar to those of the natural regime and do not pre-dispose the system to risk of loss of key ecosystem components. Wildland fires effects, behavior, and patterns are characteristic of the natural fire regime. Disturbance agents, native species habitats, herbivory, and hydrologic functions are characteristic of the natural regime. Smoke production is characteristic of the natural regime.
Moderate	> ± 25% and < ± 75% of Natural Regime	Patch or stand vegetation composition, structure, fuels, snags, down logs, and ground cover are moderately departed from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires effects, behavior, and patterns are moderately departed in comparison to the natural fire regime, generally resulting in more severe fire effects. Disturbance agents, native species habitats, herbivory, and hydrologic functions are outside the natural range and variability, but uncharacteristic conditions do not dominate. Invasive plants, insects, or pathogens do not dominate processes. Smoke production potential has increased moderately in volume and duration.
High	> ± 25% or Uncharacteristic of Natural Regime	Patch or stand vegetation composition, structure, fuels, snags, down logs, and ground cover are in high departure from the historic regime and predispose the system to high risk of loss of key ecosystem components. Components, such as large trees, native grasses, and soil, are at risk to loss even without fire as a result of stress, competition, and loss of soil cover. Wildland fire effects, behavior, and patterns are in high departure and typically dominated by uncharacteristic conditions compared to the natural fire regime, resulting in severe fire effects. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range and variability and typically result in uncharacteristic and often irreversible conditions. Invasive plants, insects, or pathogens may dominate processes. Smoke production potential has increased with risks of high volume production of long duration.

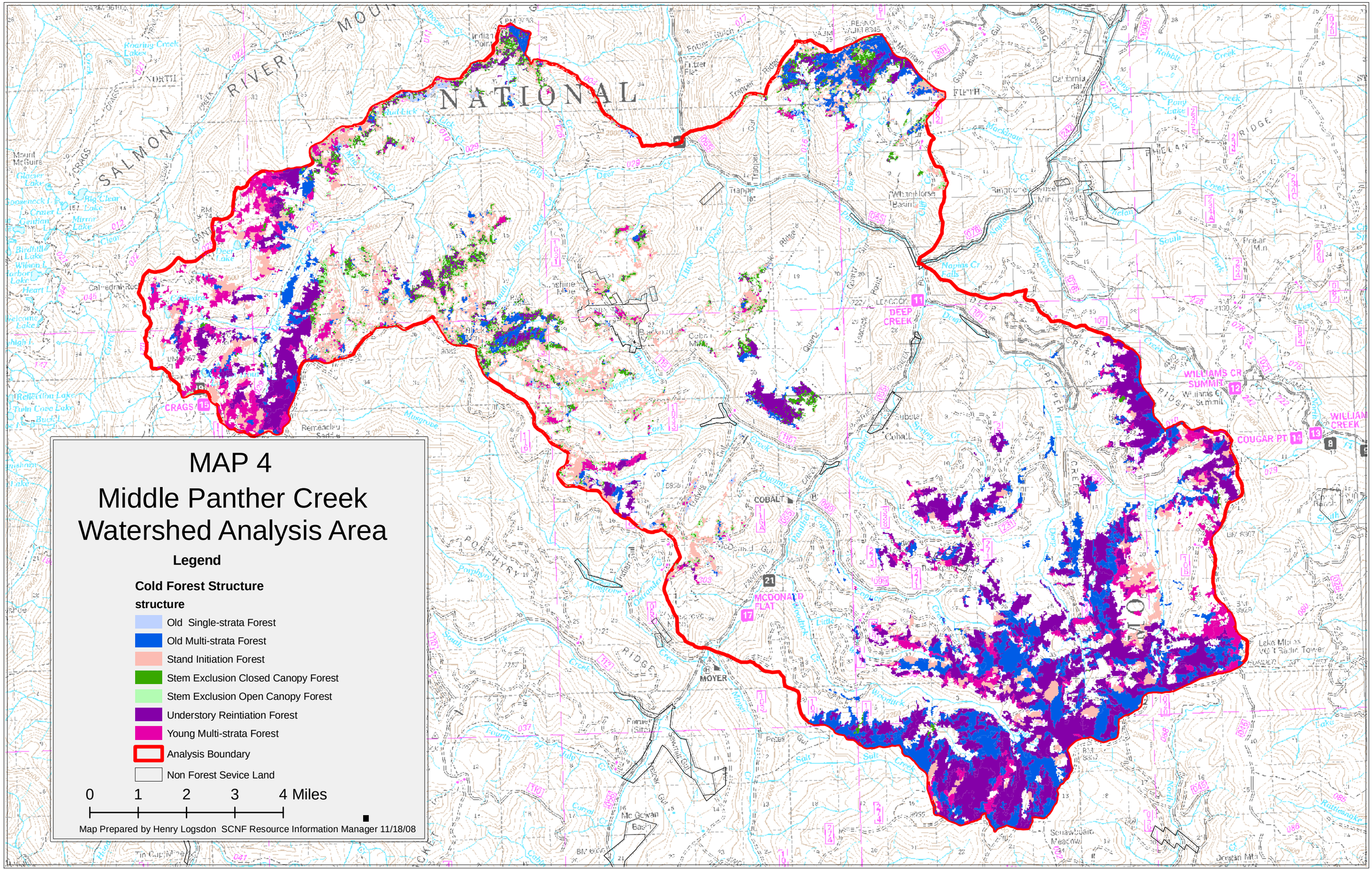
FRCC Abundance Classes

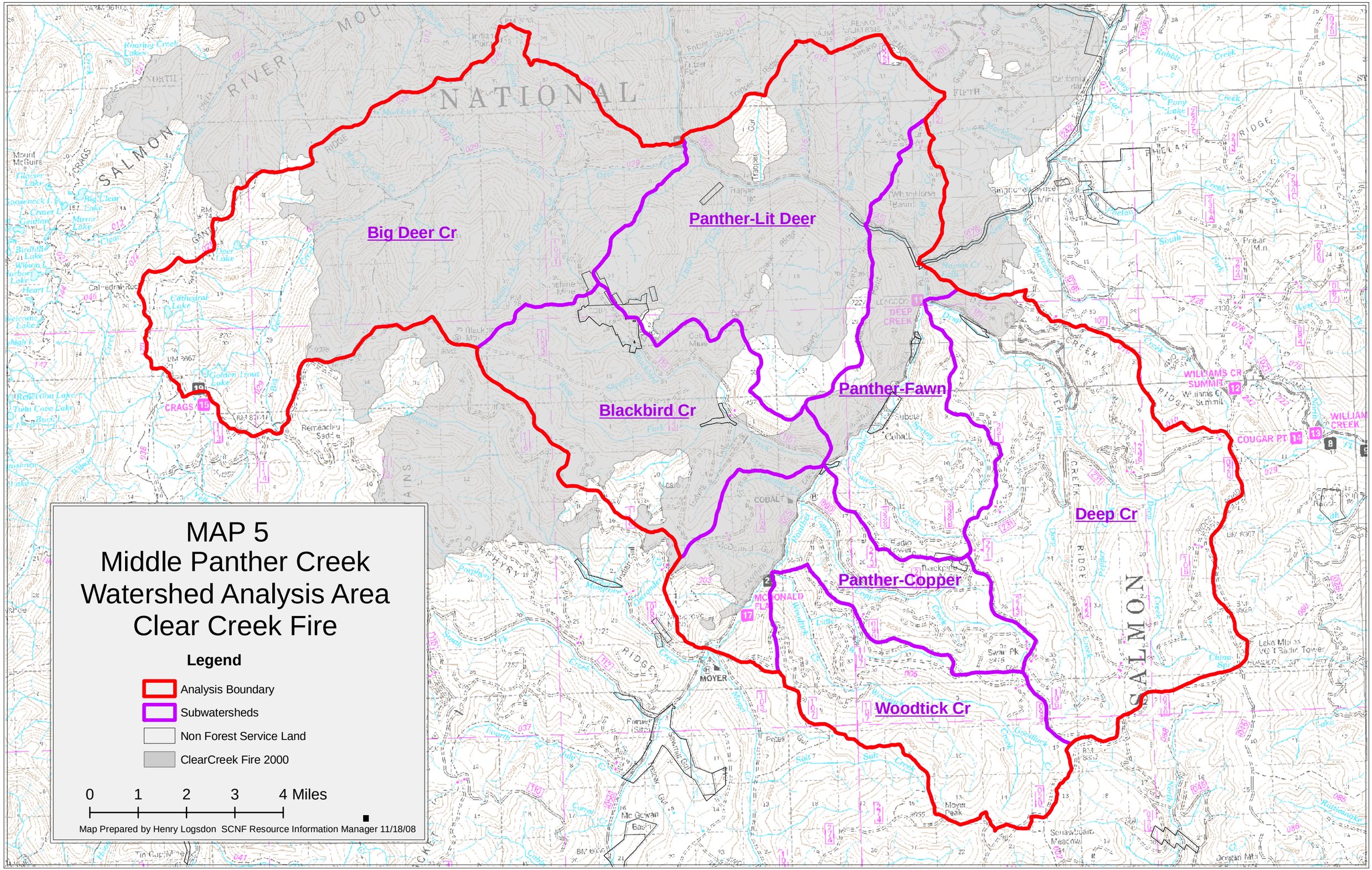
Class	NRV or HRV Departure	Description
Low	< - 25% of Natural Regime	Vegetation patch or stand with ecosystem characteristics (vegetation composition, structure, fuels, snags, down logs, and/or ground cover) that are in low or rare abundance compared to the natural regime for the project or watershed landscape. Typically, these types should be considered for maintenance or protection while recruiting more of this type in other patches or stands that support a type that is high in abundance.
Similar	Within ± 25% of Natural Regime	Vegetation patch or stand with ecosystem characteristics (vegetation composition, structure, fuels, snags, down logs, and/or ground cover) similar in abundance compared to the natural regime for the project or watershed landscape. Typically, these types should be considered for maintenance.
High	> 25% of Natural Regime or Uncharacteristic	Vegetation patch or stand with ecosystem characteristics (vegetation composition, structure, fuels, snags, down logs, and/or ground cover) that are high in abundance compared to the natural regime for the project or watershed landscape. Typically, these types should be considered for restoration or fire use activities in order to restore or maintain types that are in low or similar abundance.

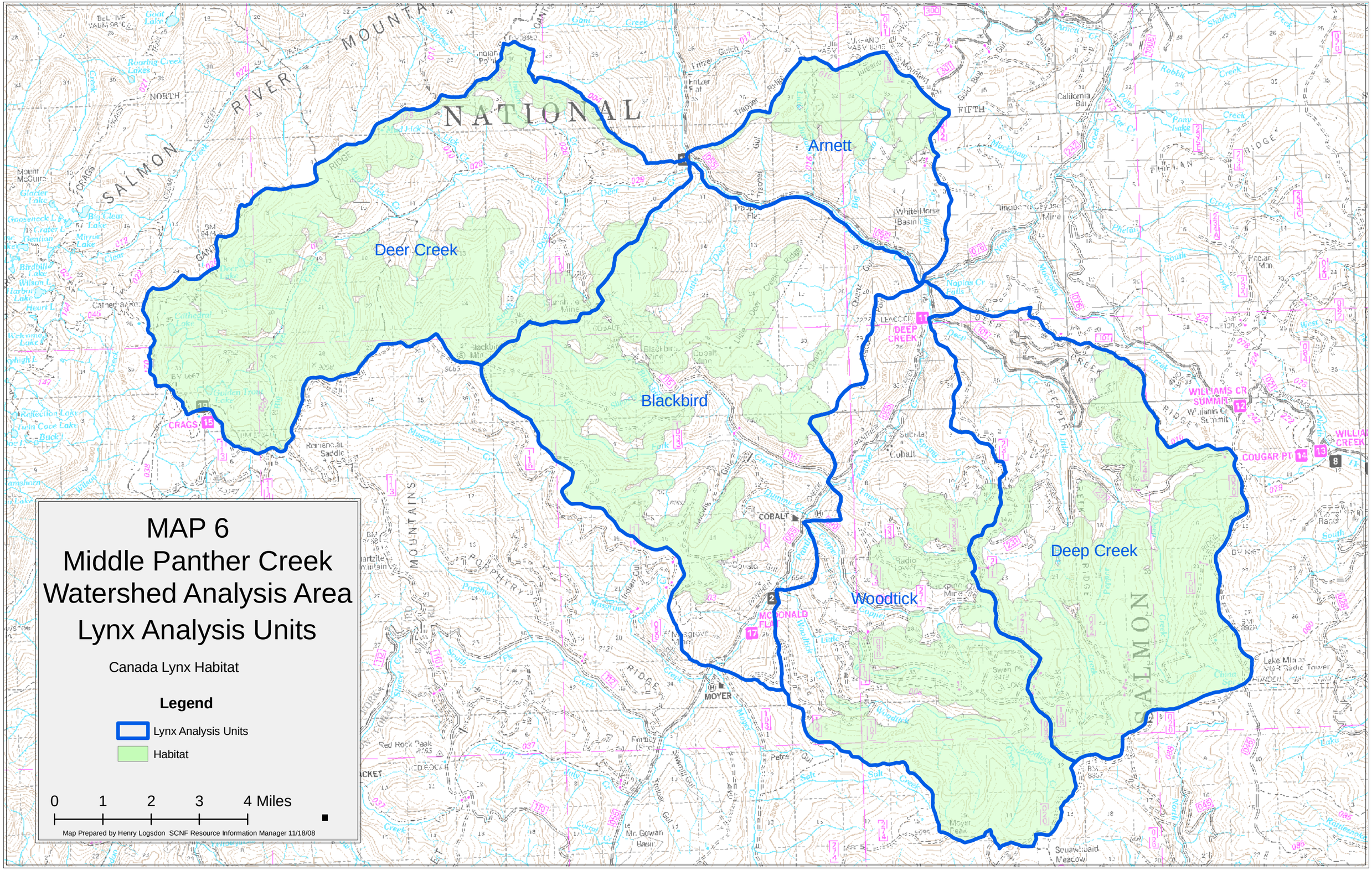

MAP 1
Middle Panther Creek
Watershed Analysis Area
Legend
FC_RONR_Wilderness Area
Analysis Boundary
Subwatersheds
Non Forest Sevice Land
Clear_Creek
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
Big Deer Cr
Panther-Lit Deer
Blackbird Cr
Panther-Fawn
Panther-Copper
Deep Cr
Woodtick Cr
Project Area
Salmon - Challis National Forest
IDAHO
Boise
SALMON
NATIONAL
RIVER
COBALT
MOYER
CRAGS
DEEP CREEK
WILLIAMS CR SUMMIT
COUGAR PT

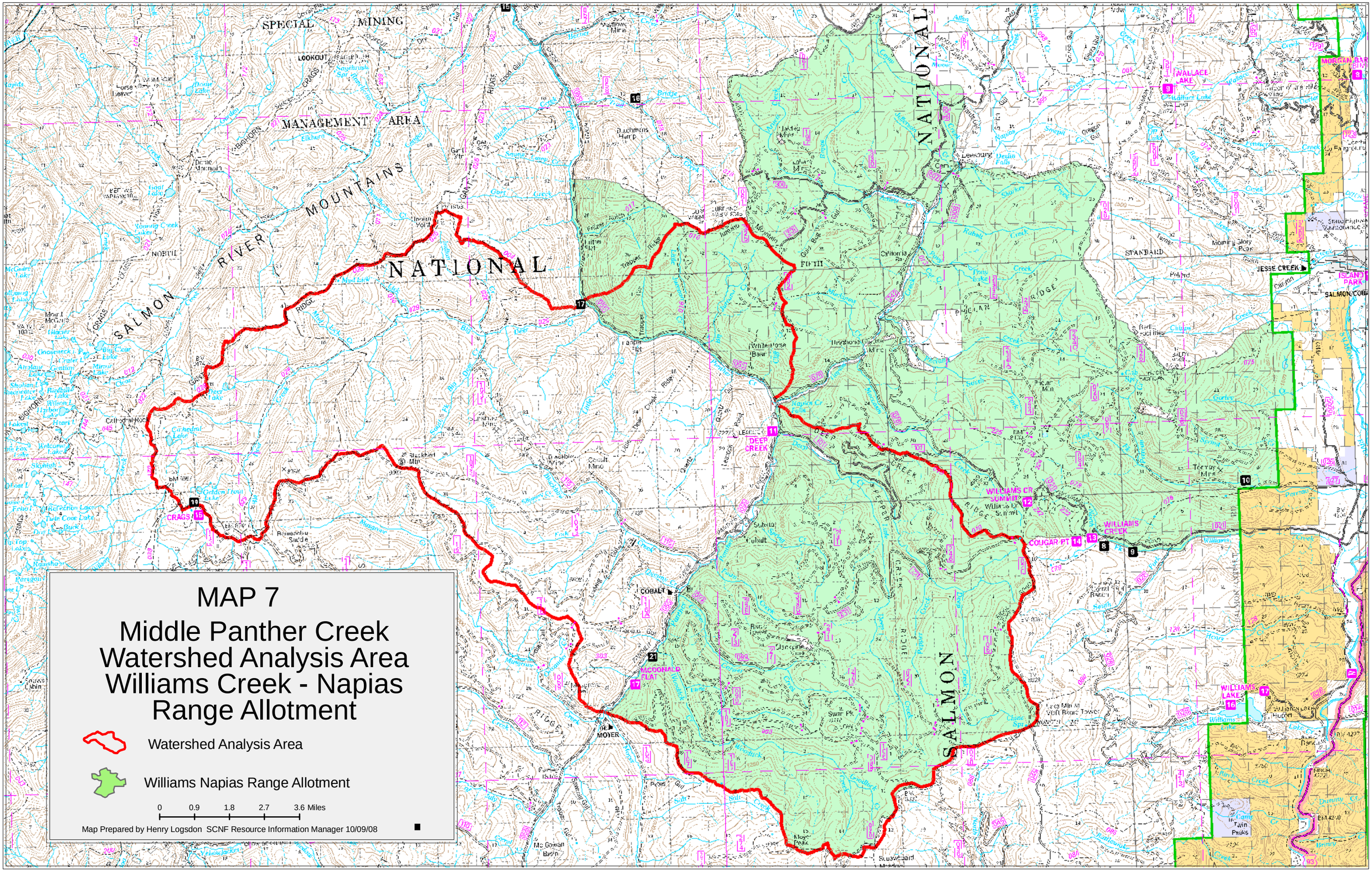

MAP 2
Middle Panther Creek
Watershed Analysis Area
Landtype Associations & Geology
Analysis Boundary
Landtype Associations
10 - Steep Canyonlands
20 - Fluvial Lands
30 - Cryoplanated Uplands
50 - Glacial Trough Lands
60 - Strongly Glaciated Lands
VB - Valley Bottoms
Geology
Granitics
Quartzites
Volcanics
Alluvium
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
SALMON
NATIONAL
COBALT
MOYER
MCDONALD FLAT
DEEP CREEK
WILLIAMS CR SUMMIT
WILLIAMS CREEK
COUGAR PT
CRAGS

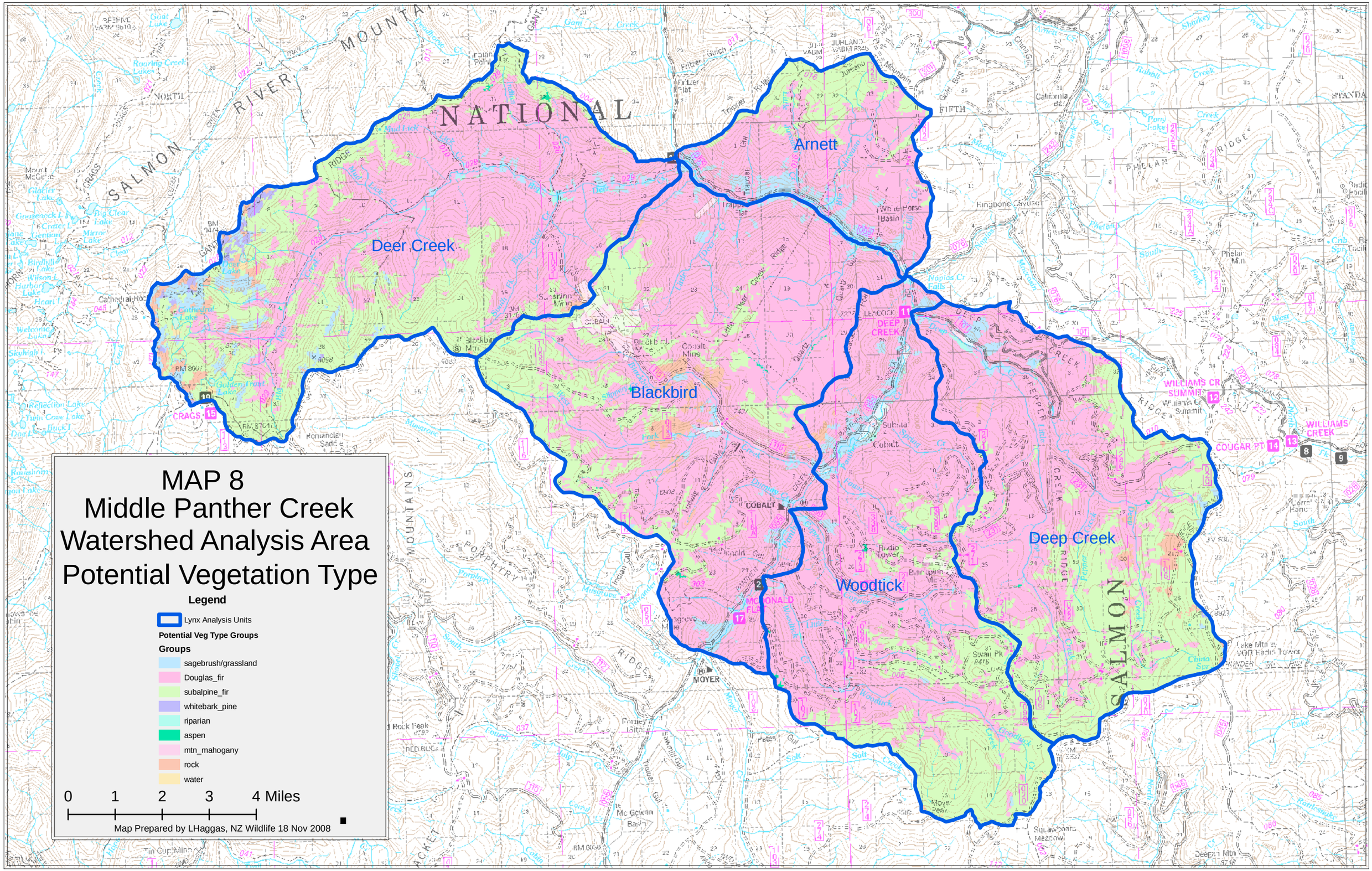

MAP 3
Middle Panther Creek
Watershed Analysis Area
Legend
Analysis Boundary
Dry Forest Structure
structure
Old Single-strata Forest
Old Multi-strata Forest
Stand Initiation Forest
Stem Exclusion Closed Canopy Forest
Stem Exclusion Open Canopy Forest
Understory Reintiation Forest
Young Multi-strata Forest
Non Forest Sevice Land
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
SALMON
RIVER
MOUNTAINS
NATIONAL
FOREST
CRAGS
PORPHYRY
RIDGE
MOYER
COUGAR PT
WILLIAMS CR SUMMIT
WILLIAMS CREEK
Moyer Peak
Swan Pk
Lake Mtn
Mc Gowan Basin
Schawbeam Meadows
Napias Cr Falls
Deep Cr
Williams Cr Summit

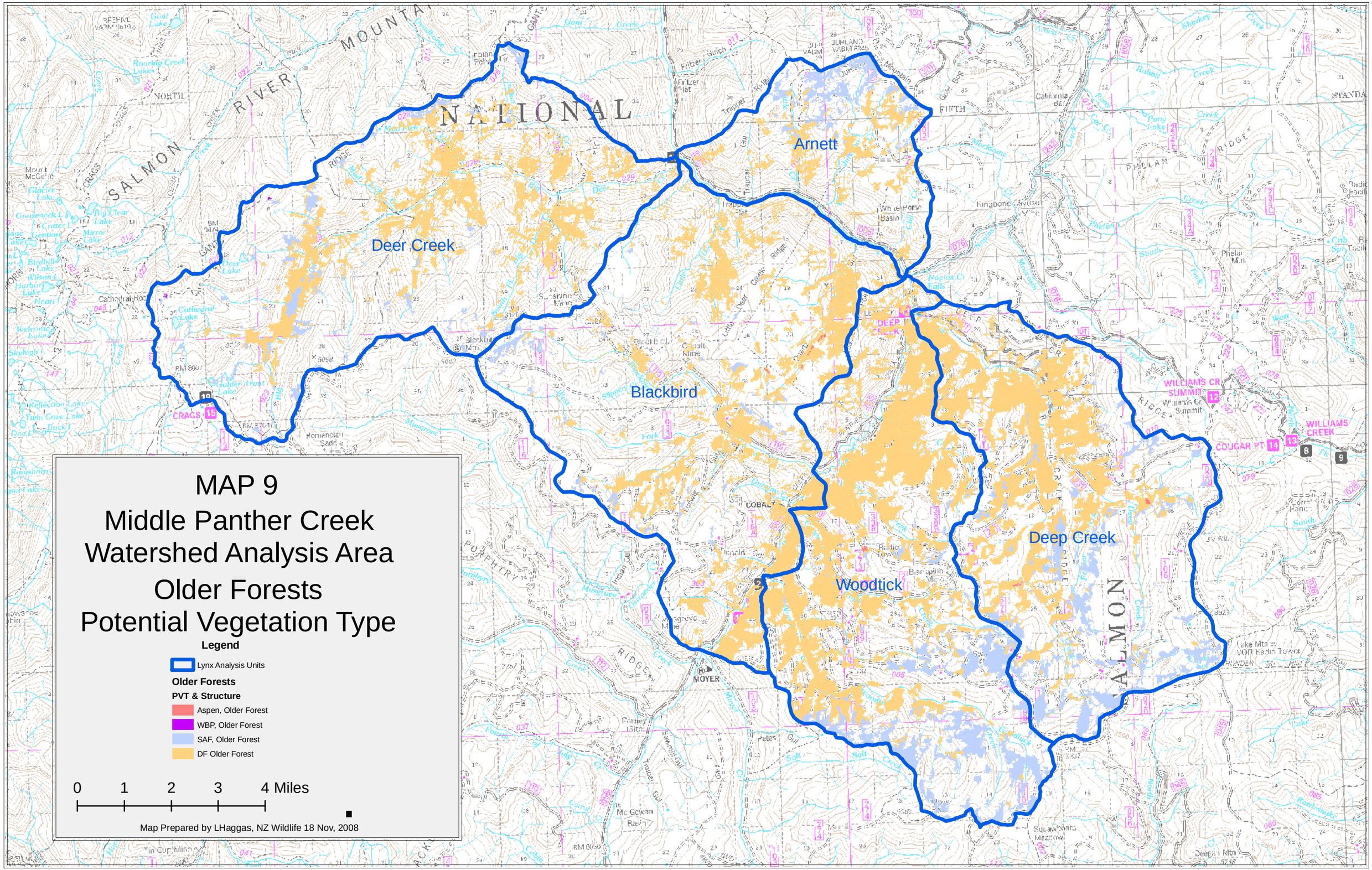

MAP 4
Middle Panther Creek
Watershed Analysis Area
Legend
Cold Forest Structure
structure
Old Single-strata Forest
Old Multi-strata Forest
Stand Initiation Forest
Stem Exclusion Closed Canopy Forest
Stem Exclusion Open Canopy Forest
Understory Reintiation Forest
Young Multi-strata Forest
Analysis Boundary
Non Forest Sevice Land
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
SALMON RIVER MOUNTAINS NATIONAL
CRAGS
DEEP CREEK
WILLIAMS CR SUMMIT
COUGAR PT
COBALT
MCDONALD FLAT
MOYER
PORPHYRY RIDGE
Mc Gowan Basin
Schawbeam Meadow
Lake Mtn
Dogwan Mtn

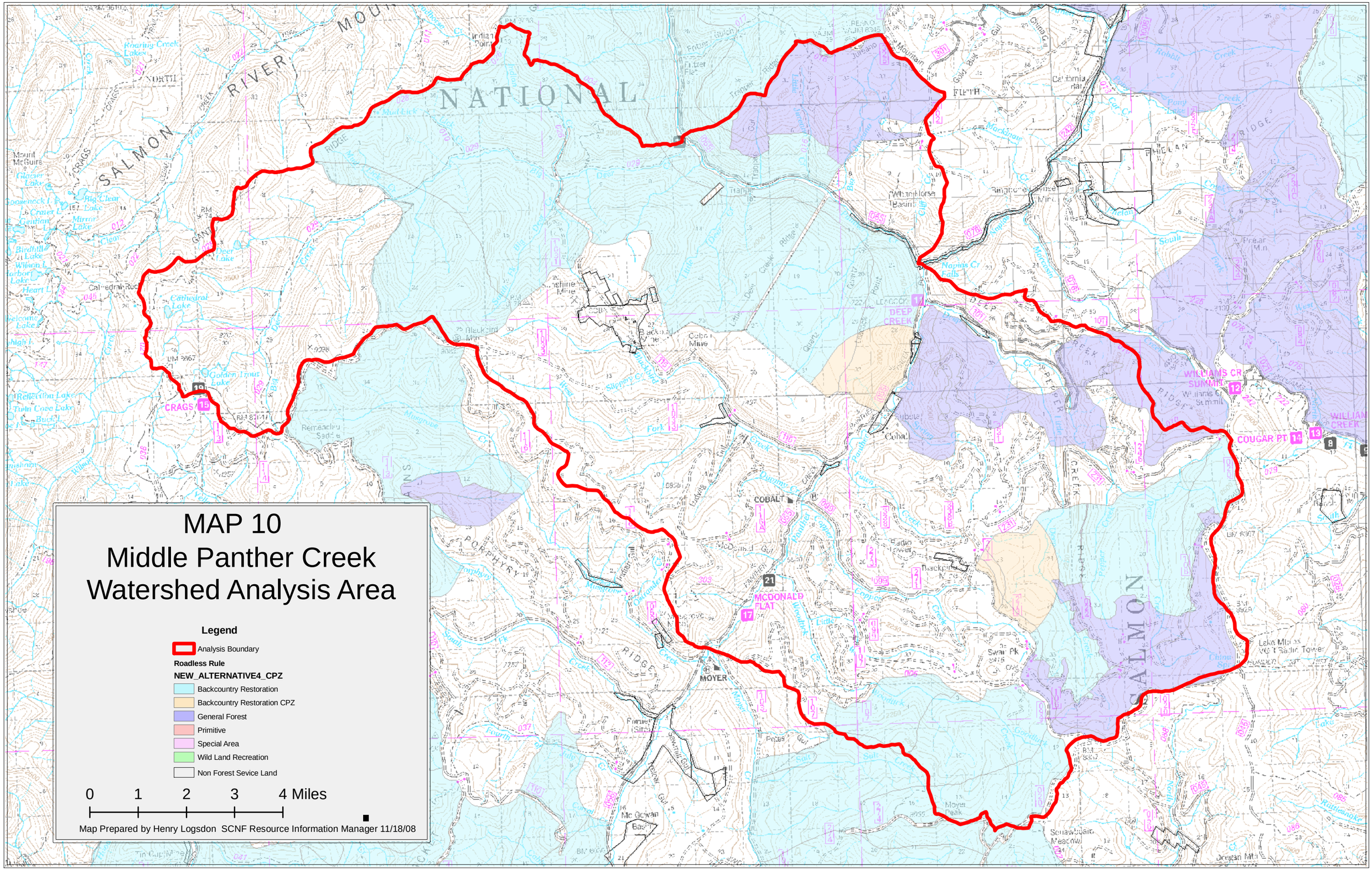

MAP 5
Middle Panther Creek
Watershed Analysis Area
Clear Creek Fire
Legend
Analysis Boundary
Subwatersheds
Non Forest Service Land
ClearCreek Fire 2000
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
Big Deer Cr
Panther-Lit Deer
Blackbird Cr
Panther-Fawn
Panther-Copper
Deep Cr
Woodtick Cr
NATIONAL
SALMON
RIVER
CRAGS
COBALT
MOYER
DEEP CREEK
WILLIAMS CR SUMMIT
COUGAR PT

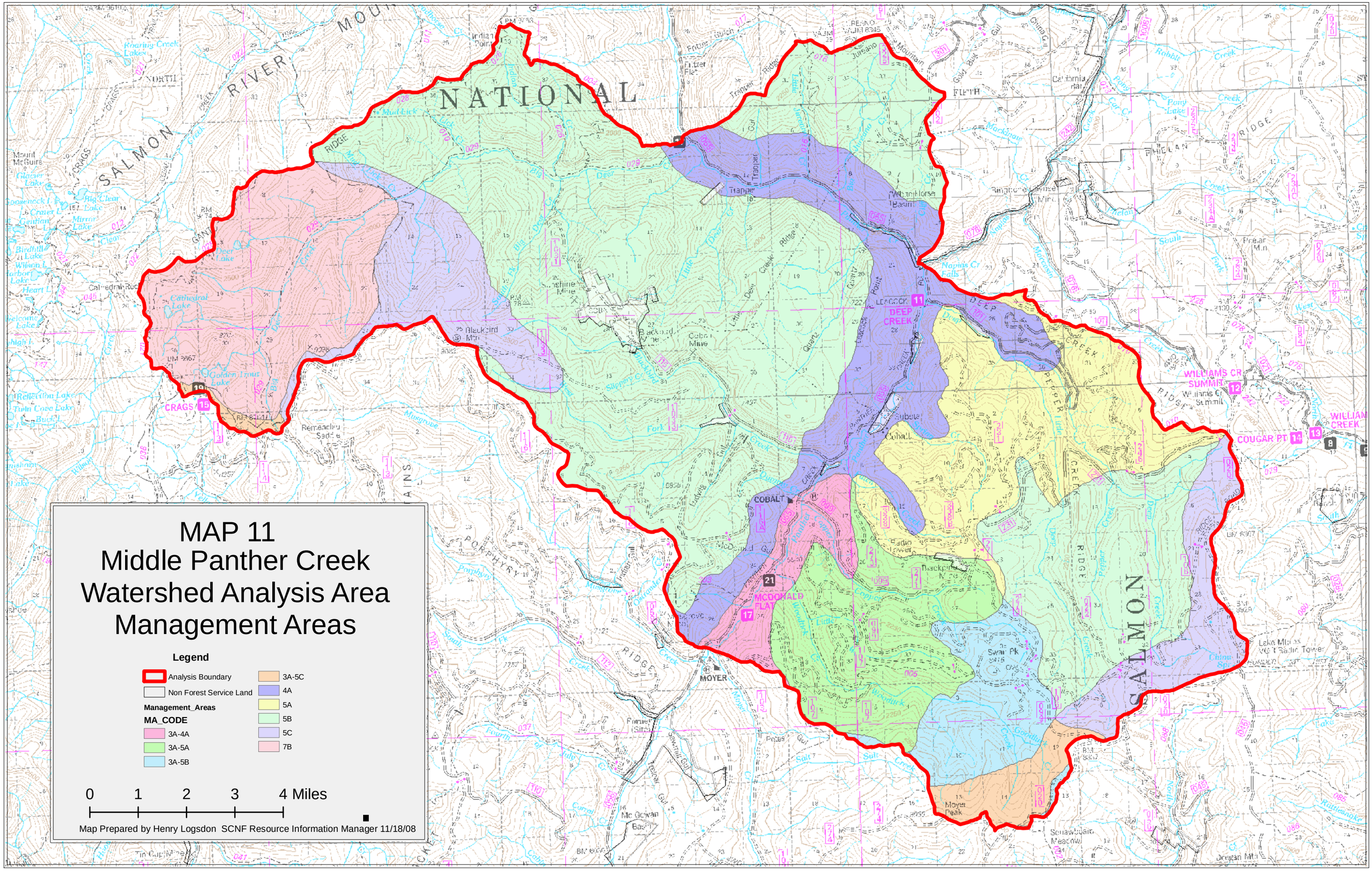

MAP 6
Middle Panther Creek
Watershed Analysis Area
Lynx Analysis Units
Canada Lynx Habitat
Legend
Lynx Analysis Units
Habitat
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
Arnett
Deer Creek
Blackbird
Woodtick
Deep Creek
SALMON RIVER MOUNTAINS
NATIONAL
COBALT
MOYER
DEEP CREEK
CRAGS
COUGAR PT
WILLIAMS CR SUMMIT

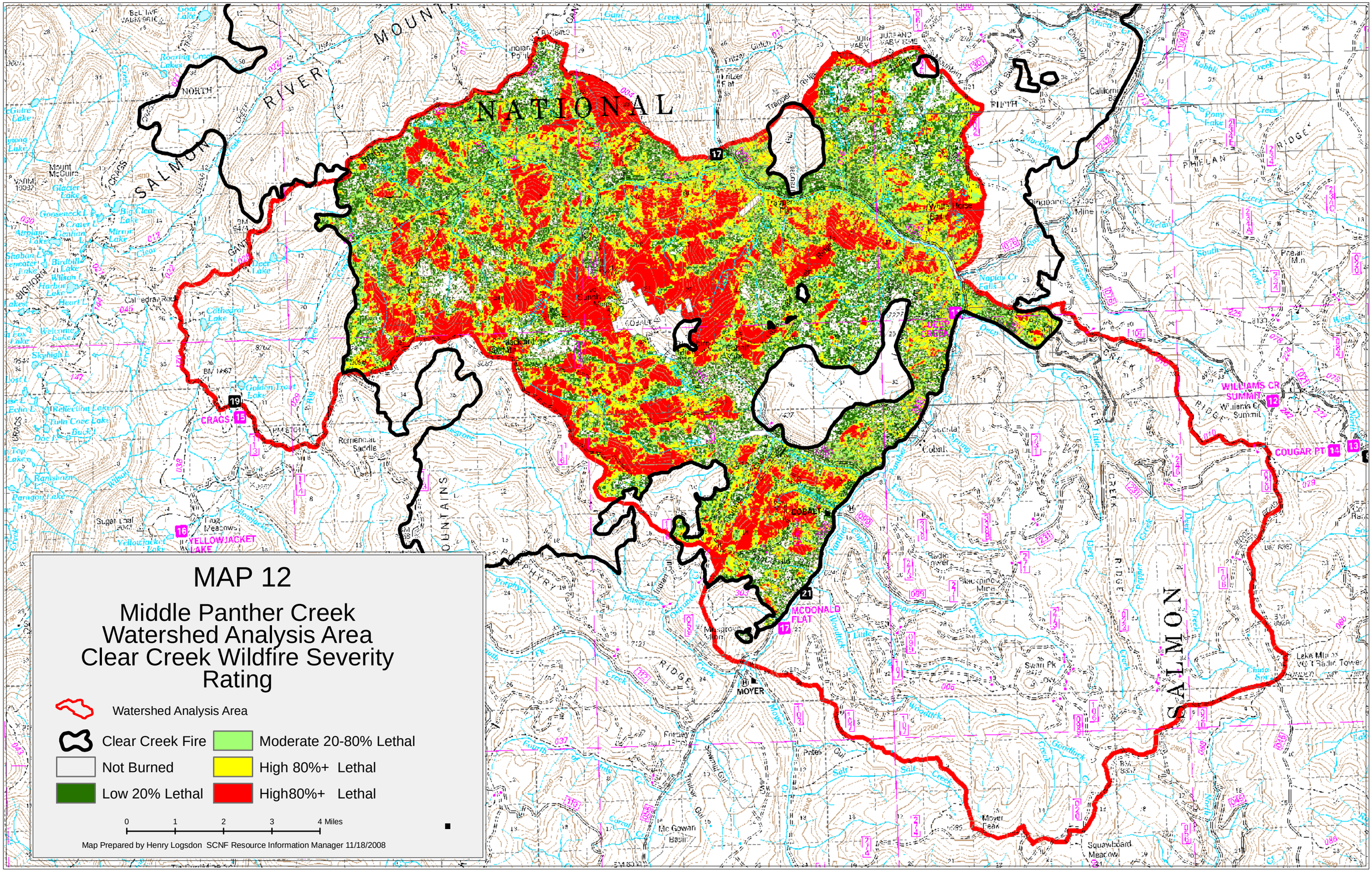

MAP 7
Middle Panther Creek
Watershed Analysis Area
Williams Creek - Napias
Range Allotment
Watershed Analysis Area
Williams Napias Range Allotment
0 0.9 1.8 2.7 3.6 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 10/09/08
SPECIAL MINING
MANAGEMENT AREA
SALMON RIVER MOUNTAINS
NATIONAL
SALMON
COBALT
MOYER
MCDONALD FLAT
DEEP CREEK
COUGAR PT
WILLIAMS CREEK
WILLIAMS LAKE
WALLACE LAKE
JESSE CREEK
MORGAN BAR
STANDARD
FIFTH
CRAGS

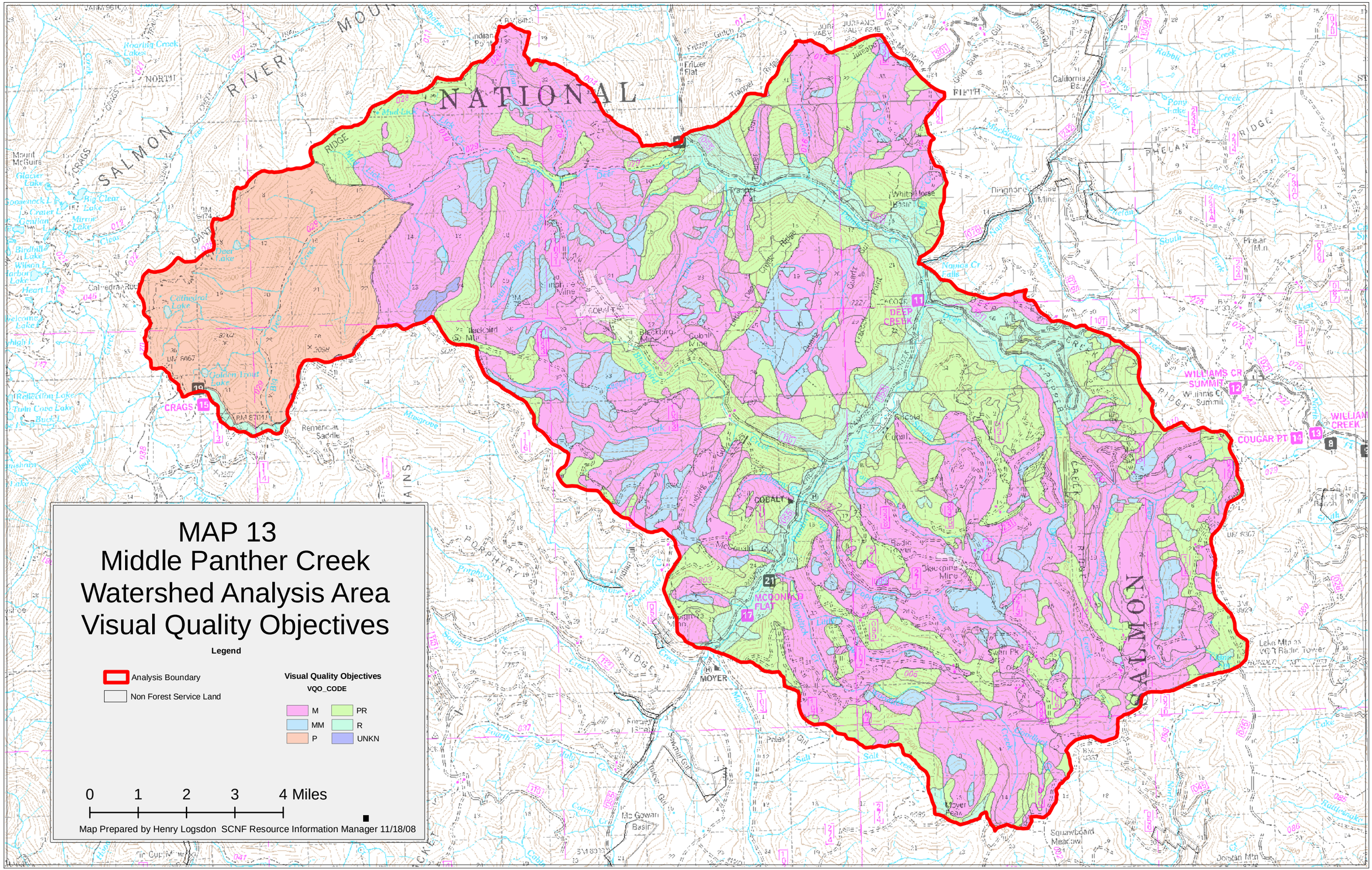

MAP 8
Middle Panther Creek
Watershed Analysis Area
Potential Vegetation Type
Legend
Lynx Analysis Units
Potential Veg Type Groups
Groups
sagebrush/grassland
Douglas_fir
subalpine_fir
whitebark_pine
riparian
aspen
mtn_mahogany
rock
water
0 1 2 3 4 Miles
Map Prepared by LHaggas, NZ Wildlife 18 Nov 2008
Deer Creek
Arnett
Blackbird
Woodtick
Deep Creek
NATIONAL
SALMON
RIVER
MOUNTAINS
COBALT
MOYER
DEEP CREEK
WILLIAMS CREEK
COUGAR PT


MAP 9
Middle Panther Creek
Watershed Analysis Area
Older Forests
Potential Vegetation Type
Legend
Lynx Analysis Units
Older Forests
PVT & Structure
Aspen, Older Forest
WBP, Older Forest
SAF, Older Forest
DF Older Forest
0 1 2 3 4 Miles
Map Prepared by LHaggas, NZ Wildlife 18 Nov, 2008
Arnett
Deer Creek
Blackbird
Woodtick
Deep Creek
SALMON
RIVER
NATIONAL
MOUNTAIN
CRAGS
WILLIAMS CR SUMMIT
COUGAR PT
WILLIAMS CREEK
DEEP CREEK
MOYER


MAP 10
Middle Panther Creek
Watershed Analysis Area
Legend
Analysis Boundary
Roadless Rule
NEW_ALTERNATIVE4_CPZ
Backcountry Restoration
Backcountry Restoration CPZ
General Forest
Primitive
Special Area
Wild Land Recreation
Non Forest Sevice Land
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
NATIONAL
SALMON
RIVER
COBALT
MOYER
MCDONALD FLAT
DEEP CREEK
WILLIAMS CR SUMMIT
COUGAR PT
CRAGS


MAP 11
Middle Panther Creek
Watershed Analysis Area
Management Areas
Legend
Analysis Boundary
Non Forest Service Land
Management_Areas
MA_CODE
3A-4A
3A-5A
3A-5B
3A-5C
4A
5A
5B
5C
7B
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
NATIONAL
SALMON
RIVER
MOUNTAINS
DEEP CREEK
COBALT
MOYER
MCDONALD FLAT
CRAGS
COUGAR PT
WILLIAMS CR SUMMIT
WILLIAMS CREEK
PORPHYRY RIDGE
SALMON RIDGE


MAP 12
Middle Panther Creek
Watershed Analysis Area
Clear Creek Wildfire Severity
Rating
Watershed Analysis Area
Clear Creek Fire
Not Burned
Low 20% Lethal
Moderate 20-80% Lethal
High 80%+ Lethal
High80%+ Lethal
0
1
2
3
4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/2008
NATIONAL
SALMON
RIVER
MOUNTAINS
COBALT
MCDONALD FLAT
MOYER
CRAGS
YELLOWJACKET LAKE
WILLIAMS CR SUMMIT
COUGAR PT
Mount McGuire
Cathedral Rock
Cathedral Lake
Golden Trout Lake
Deer Lake
Big Clear Lake
Mirror Lake
Roaring Creek Lakes
Goat Lake
Glacier Lake
Gonseneck L
Crater L
Gentian L
Birdbath L
Wilson L
Harbor Lake
Heart L
Welcome Lake
Skyhigh L
Reflection Lake
Twin Cone Lake
Buck L
Paragon Lake
Sugar Loaf
Frog Meadows
Rommelmeier Saddle
Mc Gowan Basin
Squawboard Meadow
Moyer Peak
Swan Pk
Lake Mills
Prevail Mtn
Napias Cr Falls
White Horse Basin
Trapper Flat
Blackpine Mine
Radio Tower
Cobalt
Pony Lake
Rabbit Creek
Shorkey Creek
Pheflan Ridge
Williams Cr Summit


MAP 13
Middle Panther Creek
Watershed Analysis Area
Visual Quality Objectives
Legend
Analysis Boundary
Non Forest Service Land
Visual Quality Objectives
VQO_CODE
M
MM
P
PR
R
UNKN
0 1 2 3 4 Miles
Map Prepared by Henry Logsdon SCNF Resource Information Manager 11/18/08
NATIONAL
SALMON
RIVER
MOUNTAINS
COBALT
MOYER
MCDONALD FLAT
DEEP CREEK
WILLIAMS CR SUMMIT
COUGAR PT
CRAGS
PHELAN RIDGE
PORPHYRY RIDGE
Cathedral Lake
Golden Trout Lake
Deer Lake
Remencat Saddle
Mt Gowan Basin
Squawboard Meadow
Lake Mtn VQ Radio Tower