Portneuf West Bench Fuels Reduction Project
Soils

Chapter 2
Issue Statement

Portneuf West Bench Fuels Project

Issue: Burning of vegetation can affect long-term soil productivity. Burning can remove groundcover to levels where soil loss tolerance rates, the maximum rate of annual soil erosion that will permit productivity to be sustained indefinitely, is exceeded.

> **Indicator 1:** Percent groundcover after completion of treatment to prevent erosion above the level of the soil loss tolerance of 3 Tons/Acre.
>
> **Rational for using indicator:** BLM Standard Operating Procedures (SOPs) state that erosion rates in management activity areas will be less than 5 tons/Acre/Year. DeBano and Wood cite Wishmeier as proposing, after compensating for shallow soils on rangeland sites, T values of 1.82 Tons/Acre/Year. Most soils within the Caribou-Targhee National Forest analysis area are deep (40 inches) or very deep (>60 inches) to root limiting subsurface soil layers, receive more precipitation than rangeland sites and have more biomass that contributes to organic matter. Therefore, 3 Tons/Acre is a reasonable soil loss tolerance (Exhibit 618-14, NRCS National Soil Survey Handbook).

Monitoring

1. Monitoring of groundcover and erosion
   This should be done pre, post and 1 year after fire. Groundcover transects by the nested frequency method (FSH 2209.21-93-1, 44.31) should be taken on burn areas to determine groundcover levels. Erosion should measured with an erosion bridge. The soil scientist should be responsible completing this.

Chapter3

Affected Environment

Analysis Area: The area analysis area is in the boundaries of the Portneuf West Bend Fuels Project. Activity areas are the prescribed burn and mechanical treatment units in the analysis boundaries.

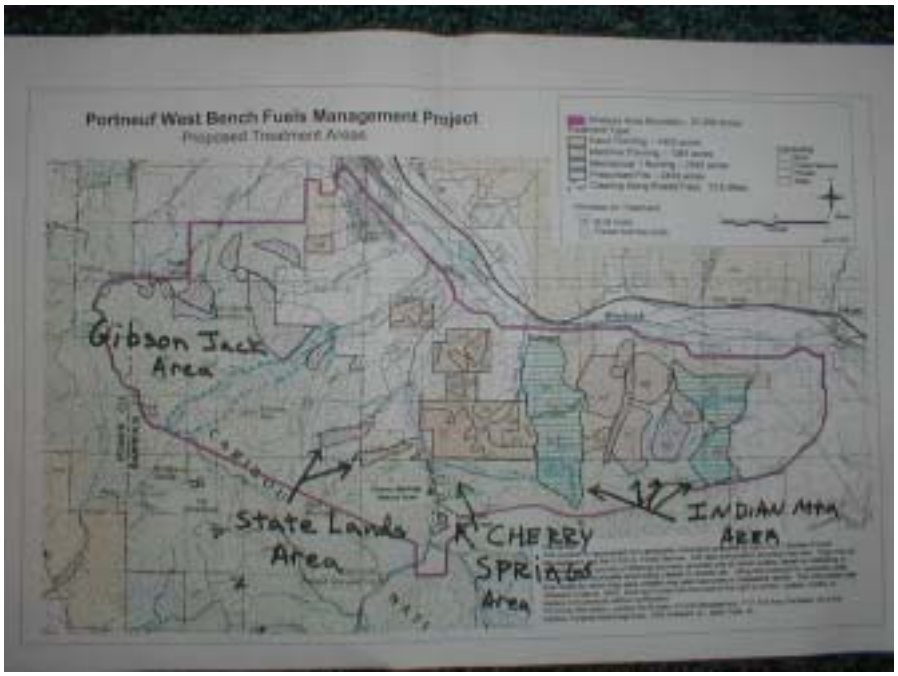
Two Landtype Associations (LTA) occur in the analysis area M331Du-51 and 52. M331Du-51 makes up the majority of the area. It occurs in a lower foothill/bench landscape setting and is typically composed of 3 landforms, toeslopes, foothills and canyons (USDA FS, 1997). Elevations range from 5,000 to 7, 298 feet. Slopes range

from 5 to 50 percent. M331Du-52 occurs in a mountain canyon landscape setting and is typically composed of 3 landforms, mountainsides, ridgelands and canyons. Elevations range from 6,000 to 8,000 feet. Slopes range from 35 to 70 percent. The landscapes are moderately dissected by dendritic streams.

Soils near and on ridgetops are generally shallow (< 20 inches) to moderately deep (20 to 40 inches). Those on sideslopes are moderately deep to deep (40 to 60 inches). Soils on lower slopes (toeslopes) are very deep (> 60 inches). A majority of these soils have 35 percent or more (by volume) rock fragments and all soils have less than 30 percent (by weight) clay. Most soils have a mollic epipedon, a dark, organic rich, relatively fertile productive topsoil. Dark organic rich epipedons are indicators of good production over a long period of time (Jensen, 1984). Parent materials of the soils are residuum, colluvium, fluvial and loess materials derived from quartzite, siltstone, limestone, dolomite, shale and sandstone.

Vegetation occurring on the LTAs is a mosaic of sagebrush and mountain shrubs on ridgelands and canyons with Douglas-fir on north-facing mountainsides. Drainageways maintain aspen stands.

Groundcover (organic litter, vegetation, rock, rock pavement covering the mineral soil) over the analysis area is sufficient to stop accelerated erosion. A minimum groundcover of 60 to 70 percent is needed to effectively control erosion (Noble, 1963). Groundcover in Lead Draw is at 80 percent and in the Mink Creek Watershed is at 84 percent. (Mink Creek water shed assessment, 1995). Range site analysis data for the Pocatello cattle and horse allotment show the average groundcover in the Indian Mountain area to be at 85 percent (See project file).



Cherry Springs Activity Areas

Soils in this area occur on sideslopes with moderate relief. They are rated moderate for erosion hazard and have a stable mass movement stability rating. (Soil Survey of the Caribou National Forest, 1990). These soils are deep (40 to 60 inches) and well drained. Range of topsoil pH is 7.2 neutral to 8.0 moderately alkaline. Sideslopes range from 30 to 45 percent, have a western aspect, a simple convex shape and are approximately 200 to 500 feet in length. Measured groundcover averages 78 percent (See Tepler Field Notes). Computer modeling of these areas with the Water Erosion Prediction Project Computer Model (WEPP) determined that with the present amount of groundcover no erosion would occur (See project file). No detrimental disturbance in the areas was observed during field visits.

Fine Organic Matter and Groundcover in northern most (top) and southernmost units

Indian Mountain/Kinney Creek Area

Soils in this area are found on moderate to well dissected moderately steep to steep sideslopes with high relief. Sideslopes of the area, in general, have a simple, convex shape, are stable, have a southern or western aspect and a gradient of 30 to 60 percent. Soil erosion ratings are moderate to high. Rocky slopes have a high potential for erosion. Range of topsoil pH is 7.9 to 9.0. Groundcover percentage is measured at 85 percent (Range site analysis sheets in project file). Computer modeling of these areas with the Water Erosion Prediction Project Computer Model (WEPP) determined that with the present amount of groundcover no erosion would occur (See project file). No detrimental disturbance was observed during field visits.

Groundcover in Indian Mountain/Kinney Creek area

Gibson Jack Activity Areas

Soils in this area occur on a variety of landforms toeslopes, moderately steep to steep rocky foothills and mountain sideslopes. Sideslopes of the area, in general, have a simple, convex shape, are stable, have many different aspects and gradients of 5 to 60 percent. Soil erosion ratings are moderate to high. Rocky slopes have a high potential for erosion. Range of topsoil pH is 6.1 to 9.0. Groundcover measured in 2 units is 74 percent (Site analysis sheets in project file) visually estimated at others at greater than 70 percent. Computer modeling of these areas with the Water Erosion Prediction Project Computer Model (WEPP) determined that with the present amount of groundcover no erosion would occur (See project file). No detrimental disturbance was observed during field visits.

Groundcover Gibson Jack

Fine Organic Matter Gibson Jack

State Land Activity Areas

Soils in this area occur on moderately steep to steep well dissected rocky foothills. Sideslope gradients range from 20 to 60 percent, are stable, rate moderate to high for erosion potential. Steep slopes have a high potential for erosion. Groundcover visually estimated at 70 percent. Computer modeling of these areas with the Water Erosion Prediction Project Computer Model (WEPP) determined that with the present amount of groundcover no erosion would occur (See project file). No detrimental disturbance observed during field visit.

Roads/Trails Clearing Activity Areas
These areas are in wide variety of soil types on many landforms. In general, slopes range from 5 to 35 percent, are stable, rate moderate to high for erosion potential. Groundcover varies from 60 to greater than 70 percent. This amount of groundcover is adequate to control accelerated erosion. Because these trails occur on so many different slopes and soils types it is difficult to predict erosion by computer modeling. No detrimental disturbance was observed.

Summary
The analysis area is in the boundaries of the Portneuf West Bend Fuels Project. Two Landtype Associations (LTA) occur in the analysis area M331Du-51 and 52. Topsoils are productive and have a moderate ability to tolerate erosion while maintaining productivity. Soil overall depths range from shallow (<20 inches) on ridgetops to very deep (> 60 inches) on lower portions of slopes. Slopes resist mass movement and range in gradient from 5 to greater than 50 percent. Average groundcover is sufficient to stop accelerated erosion. Detrimental damage is low throughout the area.

Chapter 4
Environmental Consequences

The analysis area for this section is the activity areas boundaries.

Direct and Indirect Effects of Alternative 1 (No Action)

No action will not have an effect on erosion or change in physical properties of the soil and may create a greater chance for wildfire. Current groundcover keeps erosion at natural background rates of 0.25 tons per acre (DeBano and Wood, 1990) well below the soil loss tolerance of 3 tons per acre for the soils in the activity areas. Fuel (grass, litter and shrubs) loads will be such that a wildfire could produce conditions that could be detrimental to the soil. Under the current vegetative situation a fire could easily burn 60 percent high intensity, 30 percent moderate intensity, 30 percent low intensity (Burch, 2003). This type of burn could possibly produce erosion rates in excess of soil loss tolerances, reduce the rate of vegetative recovery, increase water repellency and change physical properties of the soil reducing productivity.

Table 4-1 shows the prediction of the Water Erosion Prediction Project (WEPP) model if wildfire consumes the entire slope at different burn severities. Burn severity is a qualitative measure of the effects of fire on site on site resources (Hartford and Frandsen, 1992). Fire effects depend on interactions of energy release (intensity), duration, fuel loading and combustion, vegetation type, climate, topography and soil.

Table 4-1

Fire Severity	Gradient (%)		Length (%)		Cover (%)	Erosion (t/ac)*	Average (t/ac)**
	Upper slope	Lower slope	Upper slope	Lower slope			
Low	10 to 30	30 to 5	200	200	72	2.00	0.50
Moderate	10 to 30	30 to 5	200	200	43	10.99	2.88
High	10 to 30	30 to 5	200	200	9	30.19	8.56
Low	10 to 40	40 to 5	200	200	72	2.49	0.68
Moderate	10 to 40	40 to 5	200	200	43	14.69	3.72
High	10 to 40	40 to 5	200	200	9	39.92	11.10

*25 year return Period based on 50 years of climate
**Based on 50 years of climate

Slope lengths of 200 feet were chosen because that is what was visually estimated during field visits (Tepler Field Notes).

Direct and Indirect Effects of Alternative 1 (Proposed Action)

Surface erosion, vegetative recovery rates and potential are the major natural processes that can be affected by fire.

Groundcover (rock, vegetation and litter) consumed by fire and that part retained affect erosion. When groundcover is lost mineral soil can erode to levels that exceed soil loss tolerances reducing soil productivity. Erosion by wind, water or gravity often, but not always, increases following fire. The severity and duration of the accelerated erosion depend on several factors including soil texture, slope, recovery time of protective cover, the amount of residual litter and duff, and postburn precipitation intensity (Clark, 2001). Retaining groundcover of 25 percent on slopes with a gradient greater than 30 percent will allow soil loss tolerance levels to be exceeded (See Table 4-2 in this report). A low severity burn produces low soil heating or light ground char, occurs where litter is scorched, charred or consumed but the duff is left largely intact although it can be charred on the surface. Woody debris accumulation are partially consumed or charred. Mineral soil is not changed. The surface is mostly black although gray ash can be present for a short time. Soil temperatures at 1 cm are less than 50 C (USDA Draft BAER Guidelines). To achieve a low burn severity that retains groundcover levels that will not exceed soil loss tolerance levels moisture content of the duff layer must be greater than 30 percent (Hartford and Frandsen, 1992).

Soil texture influences erosion, vegetation recovery rate, productivity and available water capacity. Medium textured soils, loams and silt loams, like most of the topsoil in the activity areas have good moisture holding capabilities and plant available water qualities that provide for rapid vegetative recovery rates (USDA,1980). Recovery time of the vegetation portion of groundcover affects erosion. The sooner vegetation recovers the sooner erosion rates slow. Groundcover on a prescribed burn in the Gibson/Slate area in

April of 2002 on similar soils as those in the analysis area had 77 percent groundcover, enough to effectively control accelerated erosion (Noble, 1963), 1 year later (Tepler Field Notes).

View of groundcover transect area for 2002 prescribed burn

View of litter on topsoil at 2002 prescribed burn

Slope gradient influence the velocity of overland water flow contributing to erosion. Slope gradient and slope length vary through out the activity areas. Most slope lengths reach approximately 200 feet in length before there is a change in gradient that would slow overland water flow and reduce erosion effects. Table 4-2 shows erosion modeling results using the Water Erosion Prediction Project (WEPP) model. Conditions like those expected with a mosaic type prescribed burn in the activity areas, low severity fire on the

upper slope with a length of 200 feet and a shrub habitat on the lower slope, were used (See Project File).

Table 4-1
Tons per acre of erosion* for a low intensity fire

Groundcover Percentage	25	35	45	55	60	65
Slope of 20%	6.58	5.34	3.92	2.74		
Average t/ac	2.23	1.87	1.5	0.98		
Slope of 30%	9.64	8.17	6.28	3.67	2.71	2.07
Average t/ac	2.73	2.34	1.89	1.26	1.02	0.69
Slope of 40%	12.6	10.7	7.89	4.78	3.41	2.63
Average t/ac	3.52	3.04	2.43	1.63	1.31	0.88

*For a 25 year storm with a return period based on 50 years of climate.

These results predict that on slopes greater than 30 percent with a groundcover of 25 percent erosion rates on average will exceed the maximum rate of annual soil loss that will permit crop productivity to be sustained economically and indefinitely until vegetation returns to slow the erosion.

Water repellency in the activity area's soil can contribute to reduced infiltration and increased erosion. When soils are heated hydrophobic organic substances vaporize and move downward and condense at cooler underlying layers (DeBano, et al, 1970) this makes the soil repel water. The water repellency hazard of soils in the analysis area is medium (USDA, 1980).

The pH of a soil is one of the most important properties involved in plant growth (Foth, 1990). In most soils, pH is increased by the burning or heating of organic matter (USDA, 1978). The change in pH is important in the availability of nutrients to the plant as well as the requirements of desirable micronutrients (USDA, 1980). However, Clark (2001) reports that rarely do arid or semi-arid soils exhibit increased pH after burning. If there is an increase he reports it is only a few tenths of a pH unit therefore there is little effect on the soil nutrient regime. Increasing the pH a few tenths in the activity areas will make then more alkaline but still in the range for optimum nutrient plant availability to plants (Foth, 1990).

Soil nutrient changes occur from the burning of organic matter. Higher concentrations of N, P, K, Mg and Ca can be found in the upper few inches of mineral soil after a fire (USDA, 1978). Nitrogen may be a limiting factor on many sites therefore is of major concern. At low temperatures nitrogen volatilizes and decrease the site budget but the ammonium form increases. This form as well as the nitrate form is directly usable by plants (Clark, 2001). Overall, the amount of nitrogen available for to plants increases.

Prescribed burning can occasionally result in alterations to soil physical properties. These changes can be either detrimental or beneficial to site quality depending on fire severity and effects of fire on soil properties, such as moisture retention, organic matter

and erodability. Changes in soil physical properties will generally be greater with fires of high intensity. A major consequence of burning is the reduction or elimination of the surface organic layers of the soil. The ability of the surface layers to retain moisture when exposed to heat is significantly reduced. Reduction of the moisture holding capacity increases the susceptibility of the site to erosion. Permeability to water can be reduced when ash is deposited on the surface and fills pore spaces forming a surface crust. A blackened surface will absorb greater amounts of solar radiation and cause higher soil temperature and greater water evaporation from the soil. This characteristic is important in vegetation recovery since it will affect evaporation rates, frost heaving and root mortality (USDA, 1980).

Certain topographic, soil, vegetation and fuel loading conditions can be observed that provide indications necessary for predicting the effects of fire. Some of these conditions influence fire behavior while others pertain to the erosion process, vegetation recovery rate and/or productivity potential (USDA, 1980). Soil and site characteristics of activity areas indicate that most hazardous effects will be low to moderate. Because soils are of medium texture, slope configurations are generally convex, aspects vary but most are north-northeast and slopes gradients are less than 50 percent.

Table 4-2

	Textural Groupings*		
	Coarse	Medium	Fine
Erosion hazard**	High	Low	Medium
Productivity Potential	Low	High	Med-High
Vegetative Recovery Rate	Slow	Rapid	Medium

*Coarse: sands, loamy sand, medium and coarse sandy loams

*Medium: loams, silt loams,

*Fine: clays, clay loams, silty clays, silty clay loams, sandy clays and sandy clay loams

**Low erosion refers to sheet erosion

Table 4-3

Topographic Features		Relative Hazard Rating
Slope Configuration	Benches, valley fills, "flats	Low
	Concave and Convex	Medium
	V-Shaped	High
Aspect	North, Northwest, Northeast	Low
	East, Southeast	Medium
	Southwest, South, West	High
Slope Gradient	0 - 25 %	Low
	25 - 50 %	Medium
	50+ %	High

Tables adapted from USDA, 1980 p39, and 40

Clearing and thinning of vegetation along trails and in riparian areas with the "lop and scatter" method will increase groundcover that will provide erosion protection and water retention. Plants retained in the general areas should produce more biomass that contributes to higher organic matter contents of the soils. Higher organic matter contents increase the productivity of soils.

Summary

Prescribed fire may have a wide range of effects on soils depending on variations attributed to fire intensity, temperature, vegetation type and amount, soil moisture, and other factors. Burning of litter and vegetation decreases the protection they provide, increases pH, change or loss of organic matter, can create hydrophobicity, volatilizes nitrogen and other elements and transforms less volatile elements into forms that are more easily absorbed by plants or are lost by leaching (USDA, 1978). Also, heating of the soil may cause changes in some physical properties including the loss or reduction of structure, reduction of porosity and alteration of color.

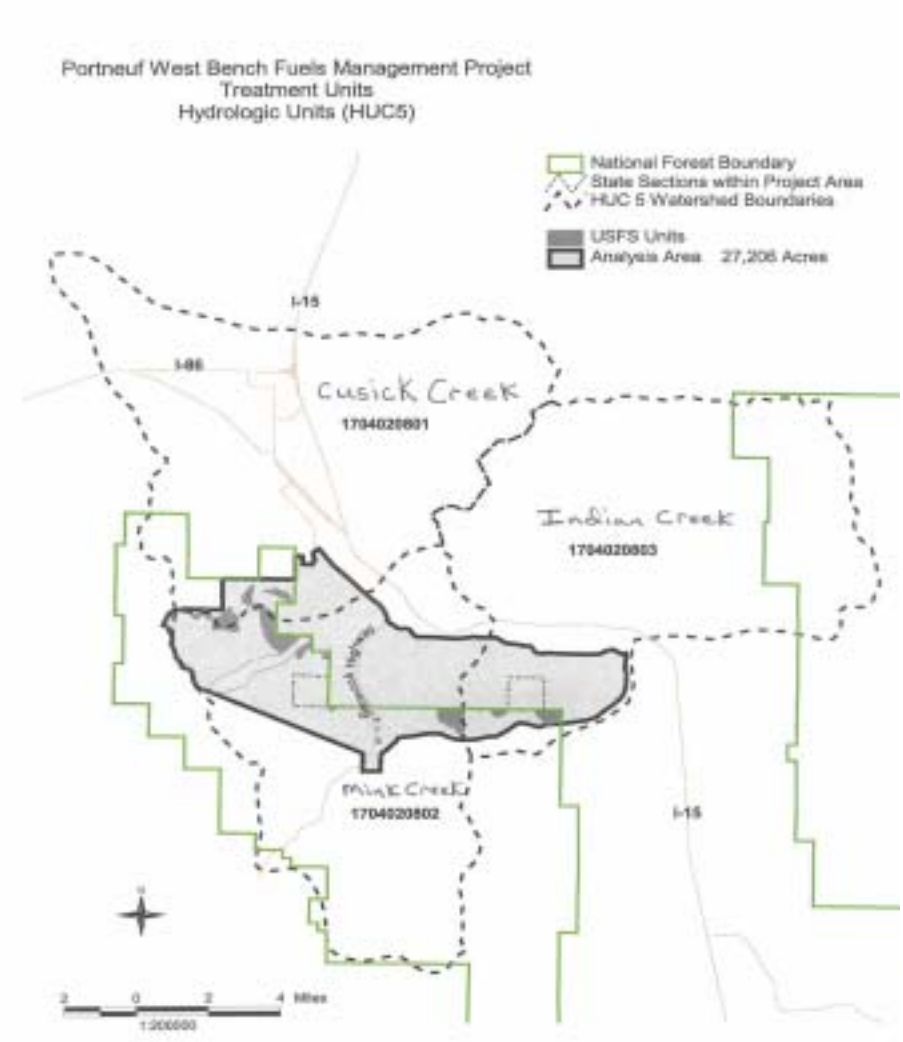
Retaining 25 percent on slopes with a gradient greater than 30 percent will allow soil loss tolerance levels to be exceeded (See Table 4-2 in soil report). Most negative effects on the soils in the analysis area should be low to moderate (See soil report).

A low burn severity will keep groundcover percentages at levels to stay within soil loss tolerance rates if duff layer moisture content is 30 percent or greater. In addition, Grier et al (1989) found light to moderate burns usually have little effect on physical properties of the mineral soil and drastic results from prescribed burning are uncommon and should not over shadow the many beneficial effects of burning.

Comparison of Alternatives			
	Will Alternative maintain Soil Productivity	Tons/ acre of erosion	Percent Groundcover
Alternative 1	Yes	0.25	85
Alternative 2	Yes	< 3*	72
* 3 tons/acre is the soil loss tolerance			

Cumulative Effects

The analysis area for this section is the boundary of the Mink, Cusick and Indian Creek Watersheds. These areas were chosen because of the effects the proposed project will have on those environments.



Cumulative effects occur when soil disturbances from past, present and foreseeable future activities are further affected by the proposed activities. Past activities in the analysis area are livestock grazing, mineral, oil and gas exploration, wildfire, prescribed burning, farming and private development. Present activities include grazing, prescribed burning and private development. Foreseeable future activities include livestock grazing, wildfire and private development.

Cumulative effects for Alternative 1 (No Action)

No burning or thinning of the vegetation in the activity areas will occur in this proposal. There would be a cumulative effect from wildfire because the "no action" will increase fuels for wildfire that may cause a high severity fire that will affect soil productivity. Fire regimes in the Portneuf Project area are predominantly mixed-severity and lethal severity regimes that periodically remove most or all of the existing vegetation (Betz, 2003).

Cusick Creek Watershed
In the Cusick watershed if all the activity areas on National Forest lands burned in a wildfire it would be 0.60 percent of the acreage of the watershed. There are no longer detrimental effects to the soils from the past activities, of the 1998 Mud Springs and Cusick fires, livestock grazing on the forest in the watershed. Because these soils affected by fire have naturally recovered with time and livestock grazing has been eliminated since the early 1980's. Livestock grazing on BLM lands, farming and private development account for the other activities in the watershed presently and in the future. These activities are not controlled by the National Forest standards and guidelines to maintain soil productivity.

Mink Creek Watershed
In the Mink Creek watershed if all activity areas on Nation Forest land burned in a wildfire it would be 2.93 percent of the watershed. In this watershed grazing has not been allowed since the early 1980's in the City of Pocatello Municipal Watershed and 2 Research Natural Areas, Gibson Jack and West Fork Mink Creek that account for 6.7 percent of the acres in the watershed. Therefore, damage from grazing in these areas has subsided. The Pocatello allotment has 77 acres of detrimental damage from grazing (Paul Butler West Side Ranger Dist, 2003). There is no damage to soil productivity from the 100 acre prescribed burn in the spring of 2000. This area has experienced regrowth of grasses and forbs (Bishop, 2003). Prescribed fires of 100 acres in 2001 and 100 acres in 2002 were burned in Mink Creek Canyon that did not affect soil productivity. Grassed, forbs and mountain brush are now regenerating well in those areas (Bishop 2003, Tepler Notes 2003). In April 2003, 50 acres of thinning of mountain brush and Juniper in the Kinney Creek drainageway occurred. Limbs close to the trail up the drainageway were chipped and scattered on the trail. Limbs further a way were piled and burnt. This caused less than 1/2 acre of damage to the soil. Total detrimental damage is 3.10 percent of the watershed acreage.

Indian Creek Watershed
In the Indian Creek watershed if all the activity areas on Nation Forest land burned in a wildfire it would be 0.14 percent of the watershed. In this watershed grazing on the National Forest has not affected soil productivity (Tepler Notes, 2003). BLM lands are grazed and will continue to be grazed but existing and future detrimental damage extent is not known. Prescribed burning and mechanical thinning of vegetation on BLM lands will cause accelerated erosion in excess of soil loss tolerances (BLM Soils Report, 2003). Private development has disturbed the most acreage in the watershed and for the foreseeable future will remove the most acreage from productivity. Lands not on the forest, BLM and private, are not compelled to follow forest guidelines therefore it is not known when, where or to what extend soils will be detrimentally damaged. Known total detrimental damage would be 0.15 percent of the watershed acreage.

<u>Cumulative effects for Alternative 2 (Proposed Action)</u>
These effects are based the assumption that a low severity burn will occur and the duff layer will have a 30 percent moisture content.

Prescribed burning on forest land will occur on approximately 537 acres and thinning on another 105. The effects on soil productivity are the same as those described in the Direct and Indirect Effects for Alternative 2 section above.

Cusick Creek Watershed
The percentage of acres to be treated in activity areas (units) 22, 24, 7 and portions of 8, 9, and 25 make up 0.19 percent of the Cusick Creek watershed. Treatment in units 7, 8 and 9 will occur 2 years before treatment in units 22, 24 and 25. Effects to soil productivity from treatments in units 7, 8 and 9 will have subsided by the year treatments in the other units will take place based on effects from prescribed burns in 2002 in the Mink Creek Canyon (Tepler Notes 2003, Bishop 2003). Effects from past activities, livestock grazing, on the forest have subsided. Grazing has not been allowed in the area since the early 1980's and no detrimental damage from grazing was observed during field visits (Tepler Notes 2003). BLM lands are grazed but the extent is not known (BLM Portneuf West Bench Project Soils Report). Groundcover has recovered from wildfires to levels where accelerated erosion is controlled. Private development has occurred but is not required to follow to forest guidelines and standards.

There are no present activities on the forest causing detrimental damage to soil productivity. BLM lands are grazed and private development is occurring.

There are no future foreseeable activities on the forest lands. BLM lands will still be grazed and private development will continue. Effects from the BLM planned hand thinning of 43 acres of vegetation will not add to the total disturbance in the watershed.

Mink Creek
In the Mink Creek watershed the percentage of acres in activity areas (treatment units) 4, 5 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 23, 25, 26, 30, and 42 make up 0.10 percent of the watershed acres. Treatments occur in different years of the project. This will allow effects from treatments to subside or totally recover before other treatments begin. No more than 150 acres will be treated in a single year. Treatments in units 4 and 5 (36 acres) will be the only ones that occur the 1st year. They will not have effects on the other treatments because groundcover should reach an effective level in controlling accelerated erosion within the year. Treatment units 8, 9 and 10 (147 acres) occur in the 2nd year. They will have no direct effect on units 4 and 5 because of their location, 4 and 5 are on the south side of the South Fork of Gibson Jack and 8 and 9 are on the north. Directs effects would be, if a unit was adjacent to another and added to overland water flow of that unit causing erosion. Treatment units 11, 12, 14, 15, 17 and 18 (71 acres) occur in the 3rd year. These units will not have a direct on the previous ones because of their location to the other units. In year 4, units 19, 20, 23, 24, 25 and 26 (77 acres) will be treated. These units would not directly affect other treatment units because of their proximity to the other units. In year 5, unit 30 (13 acres) will be treated. Unit 30 treatment is a trail clearing that will add organic matter to the soil and provide groundcover against erosion contributing to the soil productivity of the area. Unit 42 will be treated in year 7. This treatment will not have direct effects on the other treatment units. No treatment occurs in years 6, 8 and 9 in the watershed.

The City of Pocatello Municipal Watershed and 2 Research Natural Areas, Gibson Jack and West Fork Mink Creek account for 6.7 percent of the acres in the watershed. In these areas no grazing is allowed and no future activities that disturb soils are expected. Cattle grazing have caused 77 acres of detrimental damage in the watershed on forest lands (Butler, 2003). Cattle grazing will continue but detrimental effects are decreasing (Butler 2003). Prescribed fire effects on soils have subsided. Mineral, oil and gas exploration have occurred in the past but are not active presently. Approximately 2,500 acres have been withdrawn from future exploration Pocatello Ranger Dist. 1995). It is not known how many acres have been disturbed by exploration. Total acreage of the watershed in disturbance from forest activities is 0.2 percent.

Private land within the watershed is not controlled by forest standards and guidelines. Soil productivity has been reduced but it is not know how much or how much in the future will be.

Livestock grazing is allowed on BLM land but effects are unknown. Effects from the BLM planned prescribed burn and vegetation thinning will add to the total disturbance in the watershed. Approximately 310 acres will be hand thinning by "lop and scatter" method increasing groundcover and adding organic matter protecting and maintaining soil productivity. The treatments will occur over a period of 10 years and the effects will lessen with time. The BLM does not have the same guidelines for detrimental disturbance (< 15 percent of an activity area) as the forest so therefore it is not known how much damage will occur. The reduction of fuels from the burn will reduce the chance of wildfire moving from BLM land onto forest land reducing the chance of impacts to soil productivity.

Cumulatively this watershed will be minimally disturbed by the proposed action and the disturbed areas will recover rapidly therefore, soil productivity will not be impacted on the watershed scale. Total acreage of disturbance to the watershed from forest activities is less than 1 percent.

Indian Creel Watershed

The percentage of acres in activity areas (units) 37, 48, 50 and 52 to be treated make up 0.14 percent of the Indian Creek watershed. Treatments will occur in years 6, 8 and 9 of the project. This will allow effects from a treatment to subside or recover before other treatments begin. No more than 75 acres will be treated during any one year. Effects from treatment unit 37 (0.75 acres) a hand thinning, occurring in year 6, will not detrimentally effect soil productivity because it will add erosion protection and organic matter in the form of dead vegetation "lopped and scattered." Effects from treatment units 48 and 50 (75 acres) prescribed burns, occurring in year 8, will not directly affect treatment unit 52 (3 acres) but may increase overland water flow to unit 37 increasing erosion.

Past activities of livestock grazing on forest land have not had detrimental effects on soil productivity (Tepler Notes 2003). There are no present activities on the forest causing

detrimental damage to soil productivity. No future activities are foreseen other than grazing.

BLM lands have been grazed and private development has occurred and will continue to occur. Effects from the BLM planned prescribed burn and vegetation thinning will add to the total disturbance in the watershed. The treatments will occur over a period of 4 years and the effects will lessen with time. The BLM does not have the same guidelines for detrimental disturbance so therefore it is not known how much damage will occur. The reduction of fuels from the burn will reduce the chance of wildfire moving from BLM land onto forest land reducing the chance of impacts to soil productivity on forest.

Summary
The proposed alternatives occur in 3 watersheds, Cusick, Mink and Indian Creek. Detrimental effects to soil productivity from Alternative 1, the no action alternative, total less than 4 percent in any of the watersheds. The proposed prescribed burns and thinning of vegetation, Alternative 2, will not adversely affect soil productivity in the watersheds. Detrimental effects to soil productivity from the proposed action are less than 1 percent of any of the 3 watersheds. Lands outside of Caribou-Targhee administration in the 3 watersheds do not have to follow forest standards and guidelines of maintaining soil productivity.

/s/Randy Tepler
Soil Scientist April 23, 2003

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Glossary

Detrimental Soil Disturbance: Detrimental soil disturbance is soil that has been detrimentally displaced, compacted, puddled or severely burned.

Erosion Hazard Ratings: Are assuming no groundcover and that the natural soil horizons remain intact.

Low: little or no significant loss of soil expected.
Moderate: some loss of soil expected. Rill or small gully erosion may occur.
High: excessive loss of soil is expected. Significant reduction of productivity may occur.

Fine Organic Matter: Organic material on top of mineral soil consisting of fallen vegetative matter (includes woody material up to 3 inches in diameter) in various stages of decomposition.

Activity Area: An area impacted by land management activity, excluding specified transportation facilities, dedicated trails, and mining excavations and dumps.

Toe Slope: The outermost inclined surface at the base of a hill.