

**PRELIMINARY SUBSECTIONS
OF THE
COLUMBIA RIVER BASIN**

PREPARED BY:

J.A. NESSER
G.L. FORD

1995

INTERIOR COLUMBIA BASIN
ECOSYSTEM MANAGEMENT PROJECT

Preface

The following report was prepared by University scientists through cooperative agreement, project science staff, or contractors as part of the ongoing efforts of the Interior Columbia Basin Ecosystem Management Project, co-managed by the U.S. Forest Service and the Bureau of Land Management. It was prepared for the express purpose of compiling information, reviewing available literature, researching topics related to ecosystems within the Interior Columbia Basin, or exploring relationships among biophysical and economic/social resources.

This report has been reviewed by agency scientists as part of the ongoing ecosystem project. The report may be cited within the primary products produced by the project or it may have served its purposes by furthering our understanding of complex resource issues within the Basin. This report may become the basis for scientific journal articles or technical reports by the USDA Forest Service or USDI Bureau of Land Management. The attached report has not been through all the steps appropriate to final publishing as either a scientific journal article or a technical report.

METHODOLOGY USED FOR SUBSECTION MAPPING

Coordinators: J.A. Nesser, G.L. Ford

GIS: C. Maynard, J. Menakis and D. Long

ABSTRACT

This paper summarizes how the Subsection map theme was produced for the scientific assessment of the Interior Columbia River Basin. Ecological Units were developed and mapped at 1:500,000 scale. These units were based upon geologic materials, landforms, and climate. Over 203,000,000 acres were mapped in portions of seven states. The mapping was a cooperative effort of the U.S. Forest Service, Natural Resources Conservation Service, Bureau of Land Management and U.S. Geological Survey.

INTRODUCTION

Ecosystem assessments require inventories of many landscape components. Single landscape component mapping has been done for decades. Examples include soil surveys, geologic mapping, and vegetation inventories. While these single component inventories produce valuable information, the most useful mapping integrates a number of landscape components into a single map. Some examples of earlier integrated surveys include work done in Australia by CSIRO (Christian and Stewart 1968) and Land System Inventories conducted in the western United States by the USDA Forest Service (Wertz and Arnold 1972, USDA Forest Service 1976).

In the ecosystem analysis process, various questions need to be addressed. The questions are often scale-related, hence the need for a hierarchy of map units. This hierarchy makes it possible to view smaller ecosystems in the context of the larger processes and systems that shape them.

Mapping and analyzing ecoregions as complex as the Interior Columbia River Basin (ICRB) requires information on many landscape components. Some of these components (e.g., landforms, geologic materials, climate) are relatively permanent landscape features that change little during human lifetimes. Maps which integrate these types of information are called ecological maps. They are used to delimit areas having different biological and physical potential (ECOMAP 1994).

An ecological type is defined as "A category of land having a unique combination of potential natural community, soil, landscape features, and climate and differing from other ecological types in its ability to produce vegetation and respond to management. An ecological unit is defined as "A mapped landscape unit designed to meet management objectives, comprised of one or more ecological types (Forest Service Manual 2060.05).

Other landscape components (e.g., existing vegetation, wildlife populations) can change very rapidly because of natural or human caused disturbances. These types of ecosystem components can best be understood by using more permanent components as a template. Both kinds of information are needed to analyze ecosystems.

For the ICRB, these different landscape components were mapped by several teams. This paper is a general summary of the development of the geoclimatic map theme for the scientific assessment of the basin.

Mapping of Ecoregions

Ecoregions are large regional ecosystems. A number of maps and descriptions of the Ecoregions of the United States have been prepared over the last several decades (Bailey 1976, 1982, 1988) (Bailey et al. 1994) (Driscoll et al. 1984) (Omernik 1987). These maps have been based on features such as climate, landforms, geologic materials, potential natural vegetation, land use and soils.

In 1994 a map of the Ecoregions and Subregions of the United States was published at a scale of 1:7,500,000 (Bailey et al. 1994). This map delineated Ecological Units at the following four levels, from broadest to more specific: Domains, Divisions, Provinces, and Sections. Domains are normally defined using broad climatic zones. Divisions are defined using regional climatic factors. Provinces are defined using climax plant communities, landforms and altitudinal zonation. Sections are further defined based on physiography (geology and topography). The map was followed by a companion publication (McNab and Avers 1994) which provided map unit descriptions for the Sections shown on the map.

While some of the earlier Land System Inventories and more recent Ecoregion mapping were done at several scales, a standardized framework did not exist. In 1994, a National Hierarchical Framework of Ecological Units was established and defined (Table 1). The levels of the hierarchy from broadest to most specific are Domain, Division, Province, Section, Subsection, Landtype Association, Landtype and Landtype Phase. This hierarchy of ecological units has the smaller ones nested within the larger ones. Table 2 illustrates the principal map unit design criteria for the units. Table 3 shows map scale and polygon size of the ecological units.

For the scientific assessment of the Interior Columbia River Basin, a Subsection level map of over 203,000,000 acres was produced. See Figure 1 which shows the landscape characterization boundary for the area that was mapped.

To understand ecosystems, it is necessary to map those landscape components that influence ecological patterns and processes. A number of different criteria could have been used to identify and map the ecosystems of the ICRB. Some of these, such as potential natural vegetation, were done by other teams. The following paragraphs discuss the ecosystem components that were used to differentiate Subsection map units in the Interior Columbia River Basin.

Climate is a major ecosystem component that strongly influences vegetation distribution, soil genesis, animal distributions, etc. Precipitation and solar radiation are two major climatic components that control many ecological processes (Bailey 1988). Because weather stations are located mostly in the valleys and are sometimes very sparsely located throughout the Interior Columbia River Basin, regional climatic data were not readily available. For this reason, the broad distribution of major vegetation types (forest, shrubland and grassland) was used as a surrogate for climatic regions. In some areas, these broad types were further refined based upon local knowledge.

On a large scale, the geographic distribution and height of landmasses broadly control environmental gradients of temperature and moisture (Swanson et al 1988). At a mid-scale, landform features such as elevation, aspect and slope influence the distribution of solar radiation and precipitation. This can affect vegetation patterns, soil formation, hydrologic response, animal populations, etc.

Geologic materials also affect ecosystem processes. The physical and chemical properties of bedrock and surficial materials influence such processes as weathering, soil formation, vegetation distribution, and stream chemistry.

Over 203,000,000 acres were mapped within the area identified for landscape characterization. Using the 1994 Ecoregion Map and the mapping done for this project indicates that there are 7 Provinces, 23 Sections and 283 Subsections for the area covered by the landscape characterization boundary.

DEVELOPMENT OF SUBSECTION MAP THEME

Map Unit Design Criteria

Before any mapping project is undertaken, the following basic questions must be answered. What is the purpose of the map? What map scale is appropriate? What criteria will be used to draw the lines on the map? What types of information will be included in the map unit descriptions?

For the Interior Columbia River Basin Project, the map and associated information were prepared for use in the landscape ecology and aquatic portions of the scientific assessment. The map was prepared at a scale of 1:500,000 because this was found to be the scale where base maps, topographic maps and geologic maps were available for the 7 states involved in the mapping. It was also considered to be the scale that could be mapped in the amount of time that was available and was appropriate in the context of the National Hierarchy of Ecological Units.

Each subsection has some landscape components that were used to draw the lines on maps. These are called the differentiating criteria. There are other components that were described for each subsection, but not used to delineate the units. These are called accessory characteristics. Three differentia were used to draw the maps; geologic material, landform, and climate. These were considered to be important driving variables of the ecological patterns and processes that occur throughout the Interior Columbia River Basin.

The geologic materials were separated by major groups of bedrock types (e.g. intrusive igneous, carbonate sedimentary, metasedimentary) and surficial materials (e.g., alluvium, glacial till, residuum). These classes of geologic materials could not be more specific than the state geology maps that were their source. Major types of broad landforms (e.g. mountains, glaciated mountains, plateaus, plains) were the second important differentia. Broad climate was inferred from general vegetation patterns (e.g. grassland, shrublands, forest). These vegetation classes were further subdivided in some cases based on local knowledge.

Information on a number of other landscape features was used to characterize the Subsections. Examples include soils, mean annual precipitation, mean annual air temperature, surface water characteristics, slope range, elevation range, and disturbance regimes.

Sources of Information Used To Map And Describe Subsections

The USGS 1:500,000 Albers Conic Equal-Area Maps for the states of Montana, Idaho, Washington, Oregon, California, Nevada, Utah and Wyoming were used for the base maps. Geologic materials were determined from the 1:500,000 state geology maps with some minor refinements based upon local knowledge. Broad landforms were determined using 1:500,000 state topographic maps and local knowledge. Broad climatic zones were inferred from potential natural vegetation mapping using Kuchler (1964) or regional and local information.

Some characterization of average annual precipitation for map units was determined using the PRISM model. PRISM (Precipitation-elevation Regressions on Independent Slopes Model) is an analytical model, which distributes point measurements to a regular grid on regional to continental scales (Daly et al. 1994). It uses a digital elevation model (DEM) to estimate precipitation at each DEM cell using a regression of precipitation vs. orographic elevation. Precipitation maps based upon PRISM were provided by the Natural Resources Conservation Service. Statewide climatic data and local knowledge were also used.

Soils were described for each subsection using local survey data and experience where possible. Other sources of soils information included Major Land Resource Areas (USDA 1981) and State Soil Geographic Data Bases from the Natural Resources Conservation Service. Other information used to characterize the map units included DEM data and hydrography coverages.

Subsection composition can also be determined by using some of the other map themes developed for the assessment. DEM data can be used to determine the amount of each subsection in various slope classes. The state geology maps can be used to estimate the amounts of various geologic units in each Subsection. The potential natural vegetation classification can be used to characterize each subsection. Maps of average annual precipitation and other climatic variables could also be used to quantify subsection composition.

The Process

The scientific assessment of the Interior Columbia River Basin required that the Subsection Map be completed very quickly so it could be used by teams working on other parts of the analysis. It was completed using workshops comprised primarily of soil scientists and geologists with knowledge of local areas.

Preliminary maps were compiled via contract (Arnold 1994) (Holdorf 1994) and edited by the project coordinators. The maps were then reviewed and modified by knowledgeable soil scientists, geologists and ecologists from the Forest Service, Natural Resources Conservation Service, Bureau of Land Management and U.S. Geological Survey. A list of all the people who assisted with this project is included in Volume One of the Scientific Assessment.

Some brief initial descriptions were provided by the contractors but most map unit descriptions were written by the same people who finalized the maps. The initial maps were re-drafted, edited, digitized, and attributed through the Montana State Library. Additional work was done through the FS Regional Office in Portland. Plots of map have been made at 1:500,000, 1:1,500,000, and 1:2,000,000 for various users and for display.

Listed below are some statistics on the mapping:

Total Acres: 203,431,523
Number of Map Units: 283
Number of polygons: 394
Minimum size: 17,707 ac.
Maximum size: 7,587,253 ac.
Mean size: 516,324 ac.

REFERENCES

- Arnold, J. 1994. Preliminary subsection map of central and northern Idaho, western Montana and northeast Washington. Personal Services Contract with USDA Forest Service Northern Region, Missoula, MT.
- Bailey, R.G. 1978. Description of the ecoregions of the United States. Ogden, UT: U.S. Department of Agriculture, Forest Service
- Bailey, R.G. 1982. Ecoregions and land-surface forms of the United States. Map comp. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station and Kearneysville, WV: U.S. Fish and Wildlife Service, Eastern Energy and Land Use Team.
- Bailey, R.G. 1988. Ecogeographic analysis; a guide to the ecological division of land for resource management. Misc. Publ. 1465. Washington, DC: U.S. Department of Agriculture, Forest Service. 18p
- Bailey, R.G.; Avers, P.E., King, T., McNab, W.H., eds. 1994. Ecoregions and subregions of the United States (map). Washington, DC: U.S. Geological Survey. Scale 1:7,500,000; colored. Accompanied by a supplementary table of map unit descriptions compiled and edited by McNab, W.H. and Bailey, R.G.. Prepared for the U.S. Department of Agriculture, Forest Service.
- Bailey, R.G.; Jensen, M.E.; Cleland, D.T.; Bourgeron, P.S. 1993. Design and use of ecological mapping units. In: Jensen, M.E.; Bourgeron, P.S., eds. Eastside Forest Ecosystem Health Assessment--Volume II: Ecosystem management: principles and applications. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Christian, C.S.; Stewart, G.A. 1968. Methodology of integrated surveys. In: Aerial surveys and integrated studies. New York; UNESCO: 233-268
- Daly, C.; Neilson, R.P.; and Phillips, D.L. 1994. A statistical-topographic model for mapping climatological precipitation over mountainous terrain. Journal of Applied Meteorology, Vol 33, No2, American Meteorology Society
- Driscoll, R.S.; Merkel, D.L.; Radloff, D.L.; Snyder, D.E.; and Hagihara, J.S. 1984. An ecological land classification framework for the United States. Washington, D.C. U.S. Department of Agriculture, Forest Service, Miscellaneous Publication 1439, 56p
- ECOMAP. 1993. National hierarchical framework of ecological units. Unpublished administrative paper. Washington, DC, U.S. Department of Agriculture, Forest Service. 20p

Gallant, A.L.; Whittier, T.R.; Larsen, D.P. Omernik, J.M. and Hughes, R.M. 1989. Regionalization as a tool for managing environmental resources. EPA/600/3-89/060. U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, OR. 152pp

Hann, W.; Jensen, M.E.; Bourgeron, P.S.; Prather, M. 1993a. Land management assessment using hierarchical principles of landscape ecology. In: Jensen, M.E.; Bourgeron, P.S., eds. Eastside Forest Ecosystem Health Assessment--Volume II: Ecosystem management: principles and applications. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Hintze, L.F. 1980. Geologic Map of Utah, 1:500,000, Utah Geological Survey, Salt Lake City, Utah.

Holdorf, H. 1994. Preliminary subsection map of that portion of Washington, Oregon, California and Nevada within the Columbia Basin assessment area. Personal Services Contract with USDA Forest Service Northern Region, Missoula, MT.

Idaho Department of Lands, Bureau of Mines and Geology. 1978. Geologic Map of Idaho, 1:500,000. Moscow, Idaho

Jennings, C.W. 1977. Geologic Map of California, 1:750,000, Geologic Data Map 002F, California Department of Conservation, Division of Mines and Geology, San Francisco, CA

Kuchler, A.W. 1964. Potential natural vegetation of the conterminous United States. Spec. Publ. 36 [including colored folding map, scale 1:3,168,000]. New York: American Geographical Society.

Love, J.D. and Christiansen, A.C. 1985. Geologic Map of Wyoming, 1:500,000. U.S. Geological Survey in cooperation with the Geological Survey of Wyoming

McNab, W.H. and Avers, P.E. (compilers). 1994. Ecological subregions of the United States: section descriptions. USDA Forest Service, Washington, D.C.

Omernik, J.M. 1987. Ecoregions of the conterminous United States. Annals of the Association of American Geographers 77(1):118-125

Ross, C.P.; Andrews, D.A. and Witkind, I.J. 1955. Geologic Map of Montana, 1:500,000, U.S. Geological Survey

Stewart, J.H. and Carlson, J.E. 1978. Geologic Map of Nevada, 1:500,000, U.S. Geological Survey in cooperation with the Nevada Bureau of Mines and Geology.

Swanson, F.J.; Kratz, T.K.; Caine, N.; Woodmansee, R.G. 1988 Landform effects on ecosystem patterns and processes. Bioscience. 38:92-98

U.S. Department of Agriculture. 1981. Land resource regions and major land resource areas of the United States. Agriculture Handbook 296. U.S. Government Printing Office. Washington, D.C.

U.S. Department of Agriculture, Forest Service Manual 2060. Washington, DC

U.S. Department of Agriculture, Forest Service. 1976. Land system inventory guide. Missoula, Mt. Northern Region

U.S. EPA-USDA Forest Service. 1980. An approach to water resources evaluation of non-point silvicultural sources (a procedural handbook), EPA-600/8-80-012

Walker, G.W. and MacLeod, N.S. 1991. Geologic Map of Oregon, 1:500,000, U.S. Geological Survey,

Wertz, W.A.; Arnold, J.A. 1972. Land systems inventory. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region

Washington Dept of Natural Resources. 1961. Geologic Map of Washington, 1:500,000, Olympia, WASHINGTON.

IDENTIFICATION LEGEND FOR SUBSECTIONS
Final Draft - 03/10/95

SECTION 331A		Page 1
331Aa	Anatone Plateaus and Canyons	
331Ab	Palouse Hills	
331Ac	Blue Mountain Foothills	
331Ad	Camas Prairie Plateau	
331Ae	Weippe Prairie Plateau	
331Af	Clearwater Canyon Breaklands	
331Ag	Lapwai Hills and Plateaus	
SECTION 342B		Page 9
342Ba	Humboldt River High Plateau	
342Bb	Curlew Valleys and Lake Sediments	
342Bc	Jarbridge High Mountain Ranges	
342Bd	Blackfoot Mountains	
342Bg	Low Steens Mountain	
342Bh	High Desert Lake Basins	
342Bi	High Steens Mountain	
342Bj	High Desert Basalt Plateau	
SECTION 342C		Page 20
342Ca	Owyhee Basalt Plain	
342Cb	Snake River Plain	
342Cc	Owyhee Tablelands	
342Cd	Bruneau Plateau	
342Ce	Snake River Bottomlands	
342Cg	Owyhee Uplands	
342Ch	Owyhee Foothills	
342Ci	Jordan Craters	
SECTION 342D		Page 29
342Da	Upper Snake River Lava Plains and Hills	
342Db	Southern Idaho Plateaus	
342Dc	Lost River Valleys	
342Dd	Eastern Idaho Plateaus	
342De	Snake River Plains	
342Df	Snake River Plains and Buttes	
SECTION 342H		Page 35
342Ha	Kimberly-Paulina Hills	
342Hb	John Day-Clarno Hills	
342Hc	Bend-Redmond Plain	
342Hd	Millican Valley	
SECTION 342I		Page 39
342Ia	Richland Lake Basin	
342Ib	Yakima Folds	
342Ic	Ritzville Hills	
342Id	Dry Falls Basalt Scablands	
342Ie	John Day-Deschutes Canyons	
342If	Mansfield Glaciated Basalt Plateau	
342Ig	Cheney Basalt Scablands	
SECTION M242C		Page 46
M242Ca	Wenatchee Highlands	
M242Cb	Chelan and Sawtooth Highlands	

M242Cc	Cascade Mountains
M242Cd	Lapine Pumice Flats
M242Ce	Glaciated Cascade Mountains
M242Cf	Newberry Volcano
M242Cg	Oregon High Cascades
M242Ci	Cle Elum-Lake Wenatchee Mountain Valleys
M242Cm	Wenatchee-Swauk Sandstone Hills
M242Cn	Upper Yakima-Swauk Sandstone Hills
M242Co	Upper Yakima Basin
M242Cp	Naches Mountains
M242Cq	Entiat-Chelan Hills
M242Cs	Middle Methow Block
M242Ct	Upper Methow Block
M242Cu	Cascade Highlands
M242Cv	Lapine-Sycan Basins

SECTION M261D

Page 76

M261Da	Shasta Valley
M261Db	Medicine Lake Highlands and Lava Flows
M261Dc	Shingletown-Paradise Lahars and Terraces
M261Dd	High Cascades
M261De	Klamath Foothills, Oak-Grassland
M261Df	Klamath Mountains, Douglas-Fir Forest
M261Dg	Klamath Mountains, White Fir Forest
M261Dh	Klamath Mountains, Red Fir Forest

SECTION M261G

Page 85

M261Ga	Klamath-Goose Lake Basin Floor
M261Gb	Modac Basalts, Forested
M261Gc	Modac Pyroclastics, Forested
M261Gd	Klamath Basin, Grasslands

SECTION M331A

Page 91

M331Aa	Island Park Caldera
M331Ab	Pitchstone Plateau
M331Ac	Throughfare Uplands
M331Ad	Absaroka Range
M331Ae	Owl Creek Mountains
M331Af	Yellowstone Plateau
M331Ag	Northern Absaroka Range
M331Ah	Beartooth Mountains
M331Ai	Beartooth Foothills
M331Aj	Mammoth Highlands
M331Ak	West Yellowstone Valley
M331Al	Upper Yellowstone Valley
M331Am	Mount Ellis
M331An	Spanish Breaks
M331Ao	Spanish Peaks
M331Ap	Lincoln Mountain

SECTION M331D

Page 111

M331Da	Upper Cache Valley
M331Db	Portneuf Uplands
M331Dc	Cache Front
M331Dd	Bear River Highlands
M331De	Bear River Valley
M331Df	Wyoming Range Uplands
M331Dg	Webster Ridges and Valleys
M331Dh	Grays Lake Bottomlands
M331Di	Caribou Range
M331Dj	Star Valley

M331Dk	Big Hole Mountains/Snake River Range
M331Dm	Teton Range
M331Do	Pinyon Peak Highlands
M331Dp	Gros Ventre-Leidy Uplands
M331Dt	Jackson Hole
M331Du	Basin and Range Transitional Mountains
M331Dv	Hoback Basin
M331Dw	Union Pass Uplands

SECTION M331J

Page 137

M331Ja	Wind River Range Summit
M331Jb	Subsummit Uplands
M331Jc	Southeastern Wind River Mountains
M331Jd	Eastern Wind River Mountains
M331Je	Wind River Sedimentary Mountains

SECTION M332A

Page 144

M332Aa	Lochsa Canyon Breaklands
M332Ab	Freezeout Mountain Glaciated Lands
M332Ad	Elk Summit Basin
M332Ae	Hunter Peak Glaciated Mountains
M332Af	Copper Butte Glaciated Lands
M332Ag	Selway Uplands
M332Ah	Lower South Fork Clearwater Uplands
M332Ai	Elk City Uplands
M332Aj	Florence Basin
M332Ak	Gospel Peak Glaciated Mountains
M332Al	Red River-Chamberlain Basins
M332Am	Magruder Glaciated Uplands
M332An	Magruder Breaklands
M332Ao	Salmon Canyon Breaklands
M332Ap	State Divide Uplands
M332Aq	Salmon River Breaks
M332Ar	Big Horn Crags
M332As	Stanley Uplands
M332At	Sawtooth Range-Boise Mountains
M332Au	Smokey Mountain Trough Lands
M332Av	Upper South Fork Boise River Streamcut Lands
M332Aw	Soldier Mountain Foothills
M332Ax	Moore's Flat
M332Ay	Cayuse Point
M332Az	House Mountain
M332Aaa	Basin Butte/Horton Peak
M332Abb	Stanley Basin - Sawtooth Valley
M332Acc	Sawtooth Foothills
M332Add	South Fork Payette Canyon
M332Aee	Lowman Uplands
M332Aff	Boise Basin Lands
M332Agg	Boise Ridge-Payette Canyonlands
M332Ahh	Middle Fork Payette Canyon
M332Aii	Bear Valley, Landmark Basin and Uplands
M332Ajj	Upper South Fork Salmon River
M332Akk	Long Valley Basin
M332All	Long Valley Foothills
M332Amm	Fitsum Peak Glaciated Lands
M332Ann	Burgdorf Basin
M332Aoo	Granite Mountain Uplands
M332App	Middle Fork Boise Canyon
M332Aqq	Smith's Prairie Lowlands
M332Arr	South Fork Clearwater Dissected Uplands
M332Axx	Salmon River Canyonlands
M332Ayy	Trinity Mountains
M332Azz	Panther Creek Basin and Uplands

SECTION M332B

Page 226

M332Ba Bitterroot Glaciated Canyons
 M332Bb Bitterroot Tertiary Terraces
 M332Bc East Fork Mountains
 M332Bd Anaconda and Flint Creek Ranges
 M332Be Flint Creek and Upper Willow Creek Basins
 M332BF Skalkaho Creek Calcic Mountains
 M332Bg Garnet Range
 M332Bh Rock Creek Uplands
 M332Bi Frenchtown Valley
 M332Bj Ovando Mountains
 M332Bk Alice/Nevada Mountains
 M332Bl West Fork Mountains
 M332Bm Bitterroot Valley Fans and Terraces
 M332Bn Boles Point Mountains

SECTION M332C

Page 253

M332Ca Rocky Mountain Front - NE Glacier Park
 M332Cb Rocky Mountain Front - Two Medicine
 M332Cc Rocky Mountain Front - Teton
 M332Cd Slate Goat Mountain

SECTION M332D

Page 261

M332Da Snowy Foothills
 M332Db Snowy/Judith/Mocassin Mountains
 M332Dc Little Belt Mountains - Judith
 M332Dd Little Belt Mountains - Kings Hill
 M332De Crazy Mountains
 M332Df Adel Mountains
 M332Dg Beartooth Mountains
 M332Dh Big Belt Mountains
 M332Di Granite Butte
 M332Dj Boulder and Elkhorn Mountains
 M332Dk Helena / Townsend / Boulder Valleys
 M332Dl White Sulphur Springs Valley
 M332Dm South Elkhorn Mountains
 M332Dn London Hills / North Tobacco Root Mountains
 M332Do Norris Hills
 M332Dq Horseshoe Hills
 M332Dr Bridger Mountains
 M332Ds Battle Ridge
 M332Dt Shields River Valley

SECTION M332E

Page 292

M332Ea Centennial Mountains
 M332Eb Northern Lost River Range
 M332Ec McCartney Highlands
 M332Ed Southern Lost River Range
 M332Ee Morgan/Goat Mountain
 M332Ef Goat Mountain/Chamberlain Basin
 M332Eg Lemhi Valley
 M332Eh Northern Lemhi Range
 M332Ei Central Lost River Range
 M332Ek Southern Lemhi Range
 M332El Allan/Morgan Mountain
 M332Em Salmon Mountains Front
 M332En Salmon Front
 M332Ep East Pioneer - Fleecer Mountains
 M332Eq Deerlodge Valley
 M332Er Highland Mountains/Rochester Basin
 M332Es Anaconda Range
 M332Et Beaverhead Range

M332Eu	Big Hole Valley
M332Ev	Beaverhead Valley
M332Ew	Madison Valley
M332Ex	Ruby/Tobacco Root Mountains
M332Ey	Gravelly and Snowcrest Ranges
M332Ez	Pahsimeroi/Round/Big Lost/Little Lost River Valleys
M332Eaa	Blacktail Range
M332Ecc	Red Rock Basin
M332Edd	Southern Beaverhead Mountains
M332Eff	Volcanic and Granitic Uplands

SECTION M332F

Page 345

M332Fa	Pioneer Foothills
M332Fb	Bald Mountain
M332Fc	Pioneer Mountains
M332Fd	North Fork Big Lost River/Copper Basin/White Knob Mountains
M332Fe	Boulder Mountains
M332Fg	Upper Middle Fork Salmon River Mountains
M332Fh	East Fork Salmon River Mountains
M332Fi	Profile Peak - Monumental Summit Mountains
M332Ft	White Cloud Peaks

SECTION M332G

Page 363

M332Ga	Minam-Tollgate Plateau
M332Gb	Drewsey-Hampton Foothills
M332Gd	Snake River Canyon
M332Gf	Ochoco-Strawberry Highlands
M332Gg	John Day-Clarno Mountains
M332Gh	Izee Mountain Slopes
M332Gi	Izee Foothills
M332Gj	Ukiah Mountain Slopes
M332Gk	Wallowa-Elkhorn Mountains
M332Gl	Grande Ronde-Wallowa Valleys
M332Gm	Flora Basalt Plateau
M332Gn	Wallowa Grasslands
M332Go	Baker Valley Grasslands
M332Gp	Hornet Plateau
M332Gq	Sturgil Peak Plateau
M332Gr	Weiser Valley and Foothills
M332Gs	Council Mountain Uplands
M332Gt	High Valley
M332Gu	Boise Foothills-Squaw Butte
M332Gv	Seven Devils Mountains

SECTION M333A

Page 394

M333Aa	Pend Oreille Hills and Valleys
M333Ab	Eastern Selkirk Mountains
M333Ac	Purcell Trench
M333Ad	Rathdrum Prairie
M333Ae	Western Selkirk Mountains
M333Af	Priest Lake - Pend Orielle Mountains
M333Ag	Kettle-Columbia River Interfluve
M333Ah	Kettle Range
M333Ai	Kalispell Mountains
M333Aj	Republic and Toroda Grabens
M333Ak	Okanogan Dome
M333Am	Keller Hills
M333Ao	Huckleberry Range
M333Aq	Calispell Range
M333Ar	Colville-Little Spokane River Valleys
M333As	Okanogan-Methow Lowlands

SECTION M333B

M333Ba Cabinet and Purcell Mountains
M333Bb Purcell-Salish Mountains
M333Bc Flathead River Valley
M333Be Cabinet Mountains
M333Bf Hot Springs Valley

Page 419

SECTION M333C

M333Ca Livingston Range
M333Cb Flathead Block Faulted Mountains
M333Cd Swan Basin Mountains and Valleys
M333Cg Flathead Thrust Faulted Mountains

Page 428

SECTION M333D

M333Da Coeur d'Alene Mountains
M333Db St. Joe Mountains
M333Dc Clark Fork Valley and Mountains
M333Dd Clarkia Hills and Mountains
M333De Clearwater Uplands
M333Df North Fork Breaklands
M333Dg Little North Fork Mountains
M333Dh Landowner Mountains
M333Di Alberton Gorge
M333Dj East Coeur d'Alene Mountains

Page 436

331Aa Anatone Plateaus and Canyons

Location: This subsection is located in Asotin County in southeast Washington. It occurs on the northeastern flank of the Blue Mountains

Subsection Concept: This subsection consists of stream dissected plateaus and hillslopes underlain by basalt. The major general vegetative type is grassland. This map unit is separated from similar subsections based upon its thinner loess deposits and foothill position.

Subsection Setting and General Characteristics: These plateaus and canyons have an elevation range of 800 to 4100 feet (244 to 1250 meters). The dominant slope range is 3 to 30 percent on the plateaus and 2 to 120 percent in the canyons and hillslopes. The dominant type of rock is basalt. The primary geomorphic processes in these landscapes have been aeolian transport and deposition of the loess and downcutting by streams.

Mean annual precipitation ranges from 12 to 25 inches (30 to 63 cms). Summers have the least precipitation while winters have the most. The mean annual air temperature is 44 to 52 degrees F (7 to 11 degrees C).

The streams which flow through the subsection drain into the Snake River. Major streams include Asotin Creek, George Creek, Ten Mile Creek, Pintler Creek and Couse Creek. Most of these flow through deeply cut canyons.

The primary natural disturbance process is loess deposition. Human-caused disturbances include livestock grazing and non-irrigated agriculture.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings: the plateaus and canyons. A minor amount of terraces occur at lower elevations near the northern boundary adjacent to the Snake River.

The plateaus are located on low to mid-elevation sites with dominant slope gradients from 3 to 30 percent. These landscapes consist of plateaus and hillslopes. The soils have formed in loess, slope alluvium and colluvium derived from weathered basalt. The primary soils are moderately deep to deep, and moderately well drained to well drained. Surface textures are silt loams and silty clay loams. Subsoil and substratum textures are silt loams, silty clay loams, silty clays, clays and loams. The major soils are classified as Calcic Haploxerolls, Duric Natriferolls, Typic Calcixerolls, Calcic Pachic Haploxerolls, Calcic Pachic Argixerolls, Calcic Argixerolls, Pachic Ultic Argixerolls and Pachic Argixerolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue and Sandberg bluegrass.

The canyons are located on low to mid-elevation sites with dominant slope gradients of 3 to 120 percent. These landscapes consist of canyon walls, foot slopes, slump blocks and shoulder slopes. The soils have formed in loess, colluvium and slope alluvium derived from weathered basalt. The primary soils are shallow to very deep to bedrock and are well drained. Surface textures are usually silt loams with lesser amounts of loams and clay loams. Subsoil and substratum textures are clay loams, clays, loams and silt loams. The major soils are classified as Lithic Haploxerolls, Calcic Argixerolls, Calcic Haploxerolls, Lithic Argixerolls, Pachic Argixerolls, Calcic Pachic Argixerolls and Pachic Ultic Argixerolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue and Sandberg bluegrass.

Compiled By: Gary Ford, U. S. Forest Service (Source: Soil Survey of Asotin County Area, Washington)

331Ab Palouse Hills

Location: This subsection is located in the Columbia Basin in southeast Washington.

Subsection Concept: This subsection consists of moderate to steeply rolling hills of deep loess over Columbia River basalt with a few steep toes of Precambrian metasedimentary rocks. The major general vegetative type is grassland. This map unit is separated from similar subsections based upon the rolling hills of deep loess deposits.

Subsection Setting and General Characteristics: These rolling hills have an elevation range of 2000 to 5000 feet/610 to 1524 meters. The dominant slope range is 5 to 40 percent. The dominant type of rock is basalt. The primary geomorphic process in these landscapes is aeolian with windblown loess being deposited over the basalt.

Mean annual precipitation ranges from 15 inches/38 cms at lower elevations to 25 inches/63 cms at higher elevations. Precipitation occurs in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 48 to 52 degrees F (8 to 11 degrees C).

Weakly incised drainages in the loess form a low density dendritic drainage pattern. Wetland and riparian areas are common in draws and drainage ways.

The primary natural disturbance process was probably wind. Human-caused disturbance is mostly associated with non-irrigated agriculture. Water erosion and sedimentation can occur during late winter and early spring when rain occurs on frozen ground.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the rolling hills.

The rolling hills are located on mid-elevation sites with dominant slope gradients from 5 to 40 percent. These landscapes include the hills and associated drainage ways which have formed in loess over basalt. The primary soils are formed in fine-silty loess. They have a very dark topsoil with a clay-enriched subsoil. Pachic Haploxerolls and Pachic Argixerolls dominate the upland positions. In the draws and drainage ways, soils with water tables and flooding hazard are common. These are Typic Endoaquolls. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, common snowberry, rose, black hawthorn and saskatoon serviceberry.

Compiled By: Natural Resources Conservation Service

331Ac Blue Mountain Foothills

Location: This subsection is located in the foothills of the Blue Mountains of southeast Washington and northeast Oregon. In Oregon, it extends from southern Gilliam County through Umatilla County.

Subsection Concept: This subsection consists of loess covered, sloping foothills. The foothills are composed of basalt ridges dissected by streams from the Blue Mountains. The major general vegetative type is grassland. This map unit is separated from similar subsections based upon the foothill and dissected ridge landforms.

Subsection Setting and General Characteristics: These foothills have an elevation range of 1000 to 3000 feet (305 to 914 meters). The dominant slope range is 2 to 20 percent with some up to 70 percent. The dominant type of rock is basalt. The primary geomorphic processes in these landscapes are aeolian and fluvial. Windblown loess has been deposited over the basalt with subsequent downcutting by streams.

Mean annual precipitation ranges from 15 inches (38 cms) at lower elevations to 25 inches (63 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall, and snow in the winter. The mean annual air temperature is 48 to 52 degrees F (9 to 11 degrees C).

Streams from the Blue Mountains flow through this unit creating a moderately dense dendritic drainage pattern. The drainages are moderately to deeply incised.

The primary natural disturbance process was probably wind. Human-caused disturbance are mostly associated with irrigated and non-irrigated agriculture on the more gentle slopes and grazing on the steeper slopes. Water erosion and sedimentation during late winter and early spring rains can occur on frozen ground.

Subsection Ecological Relationships:

This subsection consists of three primary landscape components. These are the gently sloping uplands, the steeper uplands, and the draws and drainageways. The soil moisture regime is xeric and the soil temperature regime is mesic in all three components.

The gently sloping uplands are located on low to mid-elevation sites with dominant slope gradients from 2 to 20 percent. These landscapes include ridges and draws that have formed in loess over basalt. The dominant soils on the gently sloping uplands formed in very deep or deep, fine-silty loess. The surface is typically silt loam with a clay-enriched silt loam or silty clay loam subsoil. Pachic Haploxerolls and Pachic Argixerolls dominate the gently sloping upland positions. The dominant potential natural vegetation consist of bluebunch wheatgrass and Idaho Fescue at lower elevations. Bluebunch wheatgrass dominates on the south-facing slopes and Idaho fescue dominantes on the north. With increasing elevation, Idaho fescue and snowberry become more dominant.

The steeper upland areas are located on low to mid-elevation sites with dominant slope gradients from 20 to 70 percent. The dominant soils on the steeper upland areas formed in colluvium and residuum from basalt with a mixture of loess. The soils are shallow or moderately deep to bedrock. The surface is typically very stony silt loam with a clay enriched very cobbly clay loam subsoil. Lithic Argixerolls, Lithic Haploxerolls and Pachic Argixerolls dominate this segment of the landscape. The dominant potential natural vegetation consists of bluebunch wheatgrass and Idaho Fescue at lower elevations. Bluebunch wheatgrass dominates on the south-facing slopes and Idaho fescue dominantes on the north. With increasing elevation, Idaho fescue and snowberry become more dominant.

The draws and drainageways are located on low to mid-elevation sites with dominant slope gradients from 0 to 3 percent. The alluvial soils in the draws and drainageways have seasonal high water tables. These soils are subject to flooding. The soils are very deep to bedrock and are silt loam throughout. Typic Endoaquolls and Cumulic Haploxerolls are the dominant soils. The dominant potential natural vegetation consists of basin wildrye, bluebunch wheatgrass and Idaho Fescue.

Compiled By: Thor Thorson, Natural Resources Conservation Service

331Ad Camas Prairie Plateau

Location: This subsection is located in the Clearwater and Snake River basins of north central Idaho.

Subsection Concept: This subsection consists of poorly dissected basalt plateaus, slightly downcut, in an intermontane climate zone. Grassland and dry coniferous forest dominate the landscapes. This map unit is separated from the Lapwai Hills and Plateaus by its lower internal relief and dissection.

Subsection Setting and General Characteristics:

These plateaus have an elevation range of 800 to 4500 feet (240 to 1350 meters). The dominant slope range is 5 to 50 percent. The dominant lithology is basalt with small inclusions of Seven Devils volcanics. The primary geomorphic processes are fluvial and wind erosion. Debris torrents and colluviation act on steep walls of included small canyons.

Mean annual precipitation ranges from 15 inches (38 cm) at lowest elevations to 30 inches (76 cm) at highest elevations. Most precipitation occurs in the winter and spring months. Less than 50 percent of the precipitation falls as snow. The mean annual air temperature is 43 to 55 degrees F (6 - 13 degrees C).

The characteristic water surface features associated with this subsection include streams, ponds, and wetlands. Typically, the landscape has a moderate density of poorly entrenched low order streams, and more highly entrenched larger order streams. Wetlands occur in swales and seasonal wetlands are common because of low infiltration capacity of the soils. Ponds are naturally rare, but several have been added during agricultural development.

The primary natural disturbance processes have been fire and subsequent water or wind erosion. Natural fire regime is of high frequency and low severity, and moderate to large extent, with few barriers to fire spread. Runoff is associated with spring snowmelt or heavy rainfall. Debris torrents due to summer thunderstorms are the main mass wasting process, but instability is generally confined to canyons which are a minor part of this landscape. Human-caused disturbances include production of annual and hay crops, livestock grazing, and timber harvest in timbered canyons and higher elevation slopes. These have altered plant community composition, fire regimes, erosion rates, and sediment loads.

Subsection Ecological Relationships

This subsection consists of rolling plateaus infrequently dissected by narrow canyons. Soils of the plateaus are formed in Columbia River basalt and Seven Devils volcanics, with loess soil surface layers. These soils are classified as Ultic Argixerolls and Ultic Argialbolls. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue grassland plant associations at lower and mid elevations and ponderosa pine and Douglas-fir series at upper elevations on north aspects.

Compiled by: Nez Perce NF, Pat Green

331Ae Weippe Prairie Plateau

Location: This subsection is located in the Clearwater River basin of north central Idaho.

Subsection Concept: This subsection consists of A weakly dissected basalt plateau that has been dissected by the rejuvenated canyons of the Clearwater and North Fork of the Clearwater River. The eastern portion of the subsection has a maritime climate with the western portion tending toward the intermontaine climatic zone. Grasslands and Douglas fir occur in the western portion grade into grand fir and western red cedar in the eastern and northern portion. Frost pockets and wet meadows are scattered through the area. The map unit is seperated from adjacent "old surfaces" by lithology, soils, stream characteristics and vegetative patterns.

Subsection Setting and General Characteristics:

These plateaus have an elevation range of 2500 to 4000 feet (750 to 1200 meters). The dominant slope range is 5 to 40 percent. Columbia River basalt is the underlying rock type which is overlain by extensive areas of Palouse loess and ancient alluvium. Soils have a surface layer of loessial volcanic ash. Dominant geomorphic processes are fluvial and wind erosion. Debris avalanches, torrents and colluvial processes act on steep walls of included small canyons.

Mean annual precipitation ranges from 30 to 45 inches with most precipitation occuring during the winter and spring. About 50 percent of the precipitation falls as snow. Rain on snow climatic events are common. The mean annual air temperature is 43 to 55 degrees F (6 - 13 degrees C).

The characteristic water surface features associated with this subsection include streams, ponds, and wetlands. Typically, the landscape has a moderate density of poorly entrenched low order streams, and more highly entrenched larger order streams. Wetlands occurs in swales and seasonal wetlands are common because of the extensive occurance of fragipans and the low infiltration capacity of the soils. Ponds are naturally rare, but several have been added during agricultural development.

The primary natural disturbance processes have been fire and subsequent water or wind erosion. Natural fire regime is of high frequency and low severity, and moderate to large extent, with few barriers to fire spread. Runoff is associated with spring snowmelt or heavy rainfall. Slumps and debris torrents triggered by summer thunderstorms and rain on snow events are the main natural erosion processes, but instability is generally confined to canyons which are a minor part of this landscape. Human-caused disturbances include production of annual and hay crops, livestock grazing, and timber harvest. These have altered plant community composition, fire regimes, erosion rates, and sediment loads. Severe surface erosion in the highly erodable Palouse loess and ancient alluviums results from surface distrubances such tillage and road building.

Subsection Ecological Relationships

This subsection consists of rolling plateaus infrequently dissected by narrow canyons. Soils of the plateaus are formed in Columbia River basalt Palouse loess and ancient alluvium with loess soil surface layers. These soils are classified as Andic and Vitreandic Haplaborals, Fragiborals, and Udivitriands. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue grasslands mixed with Douglas fir, grand fir, and western red cedar

Compiled by: Clearwater NF-D.Wilson

331Af Clearwater Canyon Breaklands

Location: This subsection is located in the Clearwater River basin in north central Idaho.

Subsection Concept: This subsection consists of steep mountain slopes and stream breaklands formed through stream downcutting of uplifted plateaus, with mass wasting, especially debris avalanches and slumping. This map unit is separated from similar subsections based upon bedrock lithology.

Subsection Setting and General Characteristics: These canyon lands have an elevation range of 900 to 3000 feet (270 to 900 m). The dominant slope range is 50 to more than 80 percent. The dominant types of rocks are weakly to moderately weathered Columbia River basalt. The primary geomorphic processes in these landscapes are fluvial downcutting and erosion.

Mean annual precipitation ranges from 15 to 25 inches (38 to 64 cm). Most precipitation occurs in the winter and spring primarily as rainfall. The mean annual air temperature is 48 to 54 degrees F (9 to 12 degrees C).

The characteristic surface water features associated with this subsection include streams and rivers. Typically the landscape is highly dissected by parallel low order high energy streams that transport water and sediment rapidly to large order streams and the River that originate in other landscape settings. Wetlands occur in floodplains of lower gradient large order streams and rivers. They are a minor component of this subsection.

The primary natural disturbance processes are wildfire, surface erosion, and debris torrents, and debris avalanches associated with stream channels and sideslopes. Colluviation also adds material to lower slope positions and fluvial activity transports material to large order, moderate gradient stream reaches. Natural fire regimes are low to mixed severity, high frequency, and moderate to large extent. Livestock grazing, introduction of exotic grasses and forbs, and fire suppression have altered fire regimes, plant community composition and erosion rates. Road building has also altered erosion rates on these steep landforms. Residential development is concentrated along valley bottoms of the major streams and the River.

Subsection Ecological Relationships:

This subsection includes valley bottoms and adjacent steep slopes of the highly entrenched River.

The valley bottoms are located on low elevation sites with slopes from 1 to 30 percent. Landforms include recent floodplains, older terraces, and alluvial fans. Parent materials are mixed alluvium, overlain by loess. The primary soils are very deep silt loams and loams overlain by gravelly loams or clay loams. These soils are classified as Ultic Argixerolls, Ultic Haploxerolls, Cumulic Ultic Haploxerolls, and Typic Xerofluvents. The dominant potential natural vegetation is bluebunch and Idaho fescue plant associations on high terraces and ponderosa pine and Douglas-fir habitat types on low terraces or north aspects. Valley bottoms are a small component of this subsection.

Breaklands are on canyon walls, with slopes from 50 to more than 80 percent. Soils formed in residual and colluvial Columbia River basalt, and some loess. The primary soils are moderately deep to deep silt loams and loams. These soils are classified as Ultic Argixerolls. The dominant potential natural vegetation is bluebunch and Idaho fescue plant associations on south aspects and ponderosa pine and Douglas-fir habitat types on north aspects.

Compiled by: Nez Perce NF, Pat Green

331Ag Lapwai Hills and Plateaus

Location: This subsection is located near the confluence of the Snake and Clearwater Rivers in Nez Perce County in northern Idaho.

Subsection Concept: This subsection consists of loess covered hills and plateaus that are underlain by basalt. The major general vegetative type is a grassland. This map unit is separated from subsections to the south and east because they generally lack the loess. The areas to the north and west have thicker ash or steeper topography.

Subsection Setting and General Characteristics: These hills and plateaus have an elevation range of 800 to 2100 feet (244 to 640 meters). The dominant slope range is 0 to 30 percent on the plateaus and greater than 30 percent on the steeper slopes associated with the hills and mountains. The dominant type of rock is Columbia River basalt. The primary geomorphic process in these landscapes is aeolian and fluvial with windblown loess deposition followed by stream downcutting.

Mean annual precipitation ranges from 10 to 20 inches (25 to 50 cms). Most precipitation occurs in the winter as snow while the least amount occurs during the summer. The mean annual air temperature is estimated to be 51 to 55 degrees F (11 to 13 degrees C).

The Snake River flows along the western boundary of this unit and the Clearwater River flows along the northern boundary. Major streams which occur within the subsection include Lapwai Creek, Sweetwater Creek and Tamman Creek. These streams have downcut into the loess.

The primary natural disturbance process was fire. Human-caused disturbances include grazing and non-irrigated agriculture.

Subsection Ecological Relationships:

This subsection consists of 2 primary landscape settings. These are the mountainous slopes and canyons associated with the hills and plateaus, and the low terraces and plateaus.

The mountainous slopes and canyon walls associated with the hills and plateaus occur mostly in the eastern part of the subsection. They occur on low elevation sites with slope gradients greater than 30 percent. These landscapes consist of basalt with a thin loess cover, with some smaller areas of granite. The soils on the plateaus and south facing slopes have mesic temperatures and most north slopes are frigid. The primary soils have loamy textures and many are shallow to bedrock. The dominant soils are classified as Calcic Argixerolls, Lithic Argixerolls, Lithic Haploxerolls, Lithic Ultic Argixerolls, Typic Haploxerolls, Typic Xerochrepts, Ultic Argixerolls and Ultic Hapudalfs. The dominant potential natural vegetation consists of bluebunch wheatgrass and Idaho fescue.

The stream terraces and loess covered plateaus occur mostly in the western part of the subsection. They occur on low elevation sites with slope ranges of 0 to 30 percent. These landscapes have formed in recent alluvium and loess. The primary soils have silty textures and range from moderately deep to very deep. These soils are classified as Calcic Argixerolls, Calcic Haploxerolls and Typic Natriferolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Sandberg bluegrass, Nevada bluegrass and big bluegrass.

Compiled By: Gary Ford, U. S. Forest Service

342Ba Humboldt River High Plateau

Location: This subsection is located in the north-eastern Nevada and southern Idaho.

Subsection Concept: This subsection consists of portions of the Basin and Range with it's classic mountain ranges and narrow valleys formed from welded and non-welded silicic ash-flow tuffs, tuffaceous sedimentary rocks and rhyolitic flows and shallow intrusive rocks. The major general vegetative types include basin big sagebrush and sagebrush steppe. This map unit is separated from similar subsections based upon differences in geologic parent materials and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains ranges and valleys have an elevation range of 5,500 to 7,500 feet/1,676 to 2,286 meters. The dominant slope range is 5 to 60 percent. The dominant types of rocks are welded and non-welded tuffs, sedimentary rock and rhyolitic rock. The primary geomorphic processes in these landscapes are volcanic and intrusive uplifts on the mountain ranges, and alluvial-colluvial processes in the valleys.

Mean annual precipitation ranges from 8 inches/200 mm at lowest elevations to 16 inches/400 mm at the highest elevations. Most precipitation occurs in the fall and winter with 70 percent of the precipitation falling as snow. The mean annual air temperature is 43 to 46 degrees F/6.0 to 8.0 degrees C.

Streams typically occur in larger valleys with many intermittent streams in the smaller valleys. The Humboldt River is the major stream that occurs in this subsection. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are flooding and fire. Fire occurs historically every 25 to 30 years on the sagebrush cover types. Human-caused disturbances include grazing and agriculture with some mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountains, valleys, and foothills.

The mountains are located on all elevation sites with dominant slope gradients from 15 to 60 percent. These landscapes include ridges and mountain slopes that are formed in sedimentary and volcanic parent materials. The primary soils are shallow to very deep and well drained. Soils on the ridges are shallow and the mountain slopes and foothills are moderately deep to very deep. Surface textures are generally loam to sandy loam. These soils are classified as Argixerolls and Haploxerolls associated with sagebrush and bluebush wheatgrass potential natural vegetation.

The valleys are located on lowest elevation sites with dominant slope gradients from 5 to 25 percent. These landscapes include valley bottoms that formed from sedimentary and volcanic parent materials. The primary soils are deep to very deep and well drained. Surface textures are loam or sandy loam. These soils are classified as Durixerolls associated with basin big sagebrush potential natural vegetation.

The foothills and fans are located on low elevation sites with dominant slope gradients from 5 to 35 percent. These landscapes include rolling hills, fans and foothills of mountains formed from sedimentary and volcanic parent materials. The primary soils are deep to very deep and well drained. Surface textures are loam and sandy loam. These soils are classified as Haplargids and Durargids associated with sagebrush cover types.

Compiled By: Caribou National Forest

342Bb Curlew Valleys and Lake Sediments

Location: This subsection is located in the southern Idaho and northern Nevada.

Subsection Concept: This subsection consists of mainly valley portions of the Northern Basin and Range along with lacustrine sediments from ancient Lake Bonneville. These valleys were formed from alluvium from the surrounding mountain ranges and sediments from Lake Bonneville in the southern portions of this subsections that extend into Utah. The major general vegetative types include basin big sagebrush and sagebrush steppe. This map unit is separated from similar subsections based upon differences in geologic parent materials such as Lake Bonneville sediments and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains ranges and valleys have an elevation range of 4,500 to 6,000 feet/1,372 to 1,829 meters. The dominant slope range is 5 to 25 percent. The dominant types of rocks are sedimentary and volcanic, mainly Quaternary detritus and Pleistocene glacial-lake and shoreline deposits. The primary geomorphic processes in these landscapes are alluvial and lacustrine filled valleys from alluvium and lake sediments.

Mean annual precipitation ranges from 5 inches/125 mm at lowest elevations to 20 inches/500 mm at the highest elevations. Most precipitation occurs in the fall and winter with 65 percent of the precipitation falling as snow. The mean annual air temperature is 45 to 55 degrees F/7.0 to 13.0 degrees C.

Streams typically occur in larger valleys with many intermittent streams in the smaller valleys. The Malad River, Bannock Creek, Deep Creek and portions of the Raft River are the major drainages in this subsection. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are flooding and fire. Fire occurred historically every 25 to 30 years on the sagebrush covertypes. Human-caused disturbances include grazing and agriculture with some mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms, and terraced foothills and fans.

The valleys bottoms are located on lowest elevation sites with dominant slope gradients from 5 to 15 percent. These landscapes include bottoms and formed from sedimentary and volcanic parent materials. The primary soils are deep to very deep and well drained. Surface textures are loam or sandy loam. These soils are classified as Calciothids associated with basin big sagebrush potential natural vegetation and Natragids associated with saltbush-greasewood potential natural vegetation.

The terraced foothills and fans are located on highest elevation sites with dominant slope gradients from 10 to 25 percent. These landscapes include rolling hills, fans and terraced foothills, remnants of Old Lake Bonneville that were formed from sedimentary and volcanic parent materials. The primary soils are deep to very deep and well drained. Surface textures are sandy loam. These soils are classified as Haploxerolls, Palexerolls, Calcixerolls and Argixerolls associated with sagebrush-shrub cover types.

Compiled By: Caribou National Forest

342Bc Jarbidge High Mountain Ranges

Location: This subsection is located in the northern Utah and Northern Nevada.

Subsection Concept: This subsection consists of portions of the Basin and Range and consists of the Jarbidge Mountains, Independence Mountain Range, Bull Run Mountain Range in Nevada, and Grouse Creek Mountain Range in Utah. These mountain ranges formed from welded and non-welded silicic ash-flow tuffs, tuffaceous sedimentary rocks, rhyolitic flows and shallow intrusive rocks, and quartzite. The major general vegetative types include basin big sagebrush and Douglas-fir at the higher elevations. This map unit is separated from similar subsections based upon differences in geologic parent materials and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains ranges have an elevation range of 6,000 to 10,800 feet/1,829 to 3,292 meters. The dominant slope range is 15 to 70 percent. The dominant types of rocks are welded and non-welded tuffs, quartzite and rhyolitic rock. The primary geomorphic processes in these landscapes are volcanic and intrusive uplift to form the mountain ranges.

Mean annual precipitation ranges from 12 inches/300 mm at lowest elevations to 30 inches/760 mm at the highest elevations. Most precipitation occurs in the fall and winter with 55 percent of the precipitation falling as snow. The mean annual air temperature is 32 to 46 degrees F/0.0 to 8.0 degrees C.

Small streams typically occur as tributaries to larger streams in the valleys with many intermittent streams in the smaller valleys. The landscape is moderately dissected.

The primary natural disturbance processes are fire. Fire occurred historically every 25 to 30 years on the sagebrush covertypes. Human-caused disturbances include grazing with some mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain sideslopes and ridges.

The mountain sideslopes are located from the lowest elevation sites to the highest with dominant slope gradients from 15 to 60 percent. These landscapes include footslopes and sideslopes that are formed in quartzitic and volcanic parent materials. The primary soils are shallow to very deep and well drained. Surface textures are generally loam and sandy loam. These soils are classified as Argixerolls and Cryoborolls associated with sagebrush and bluebunch wheatgrass potential natural vegetation with Douglas-fir at the higher elevations.

The ridges are located on highest elevation sites with dominant slope gradients from 5 to 25 percent. These landscapes include shoulderslopes and ridges formed from quartzitic and volcanic parent materials. The primary soils are generally shallow and well drained. Surface textures are loam or sandy loam. These soils are classified as Cryoborolls and Arixerolls associated with basin big sagebrush potential natural vegetation.

Compiled By: Caribou National Forest

342Bd Blackfoot Mountains

Location: This subsection is located in the southeast Idaho, near Blackfoot Reservoir.

Subsection Concept: This subsection consists of mountains and plateaus north of Soda Springs, Idaho that include the Chesterfield Mountain Range, Blackfoot Mountain Range, Gem Valley and Portneuf Valley. These mountain ranges and valleys formed from basalt flows, welded tuffs and ash flows and Quaternary wind blown deposits located along the Snake River plain. Some Quaternary alluvium also exists. The major general vegetative types include sagebrush steppe and Douglas-fir at the higher elevations. This map unit is separated from similar subsections based upon differences in geologic parent materials and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains ranges and plateaus have an elevation range of 4,800 to 7,500 feet/1,463 to 2,286 meters. The dominant slope range is 5 to 50 percent. The dominant types of rocks are basalt flows, welded tuffs, Quaternary alluvium and wind blown deposits. The primary geomorphic processes in these landscapes are volcanic and intrusive uplift to form the mountain ranges and alluvium on the plateaus and valleys. Wind blown deposits cover the surfaces on the benches along the Snake River plain.

Mean annual precipitation ranges from 12 inches/300 mm at lowest elevations to 28 inches/711 mm at the highest elevations. Most precipitation occurs in the fall and winter with 60 percent of the precipitation falling as snow. The mean annual air temperature is 36 to 46 degrees F/2.2 to 8.0 degrees C.

Small streams typically occur as tributaries to larger streams in the valleys with many intermittent streams in the smaller valleys. The major streams are Willow Creek, Portneuf River, Blackfoot River and portions of the Bear River. The landscape is slightly dissected.

The primary natural disturbance processes are fire and flooding. Fire occurred historically every 25 to 30 years on the sagebrush covertypes. Human-caused disturbances include grazing, agriculture and phosphate mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain sideslopes and plateaus, and broad valleys and benches.

The mountain sideslopes and plateaus are located on the highest elevation sites with dominant slope gradients from 15 to 50 percent. These landscapes include footslopes and sideslopes and high plateaus that are formed from basalt flows and welded tuff parent materials. The primary soils are shallow to very deep and well drained. Surface textures are generally loam and silt loam. These soils are classified as Pachic Cryoborolls and Argic Cryoborolls associated with sagebrush and bluebunch wheatgrass potential natural vegetation with Douglas-fir at the higher elevations.

The valleys and benches are located on lowest elevation sites with dominant slope gradients from 5 to 25 percent. These landscapes include valley bottoms and benches formed from Quaternary alluvium and wind blown deposits on the benches. The primary soils are generally very deep and well drained. Surface textures are silt loam or loam. These soils are classified as Calciorthodic Haploxerolls and Xerollic Calciorthids on the Benches, and Calcic Arixerolls and Calciorthodic Haploxerolls in the valleys associated with basin big sagebrush potential natural vegetation.

Compiled By: Caribou National Forest

342Bg Low Steens Mountain

Location: This subsection is located in the lower elevations of the Steens, Pueblo and Trout Creek Mountains in southeastern Oregon

Subsection Concept: This subsection consists of the lower elevations of uplifted basalt fault block mountains and isolated mountain ranges within the basin and range physiographic province. It consists of north-south trending mountain ranges and the dip slope of fault block mountain ranges. The major general vegetative type is shrub-grassland. This map unit is separated from similar subsections because of its mountainous topography compared to the lava flow plateaus at lower elevations.

Subsection Setting and General Characteristics: These mountains have an elevation range of 4700 to 6500 feet (1433 to 1981 meters). The dominant slope range is 2 to 20 percent on the dip slope of the Steens and 30 to 70 percent on the sideslopes of the Pueblo and Trout Creek Mountains and the scarp face of the Steens Mountain. The dominant type of rock is Miocene basalt with lesser amounts of granitics. The primary geomorphic process on the dip slope of the Steens and other gently sloping areas is fluvial. On steeper slopes the primary process is gravitational.

Mean annual precipitation ranges from 10 inches (25 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is mostly in the form of snow with spring and fall rains and occasional summer thunderstorms. The mean annual air temperature is 42 to 45 degrees F (6 to 7 degrees C).

Water is generally lacking in late summer and early fall except for small water impoundment structures for livestock grazing.

The primary natural disturbance process is fire. Short duration and low intensity brush fires occur due to summer thunderstorms. Water erosion has also occurred. Human-caused disturbances include livestock grazing and recreation.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components, the gently sloping mountains and the steeper mountain slopes:

The gently sloping mountain are located on mid-elevation sites with dominant slope gradients from 2 to 20 percent. These landscapes include the gentle dip slope of the Steens Mountain which has formed by the block faulting of the basalt. The soil moisture regime is aridic and the soil temperature regime is frigid. The primary soils are shallow to bedrock. The surface is typically very cobbly loam with a dense clay subsoil. Lithic Argixerolls dominate this component. The dominant potential natural vegetation consists of low sage, Idaho fescue, bluebunch wheatgrass, western juniper and Sandberg bluegrass.

The steeper mountain slopes are located on mid to high elevation sites with dominant slope gradients from 20 to 70 percent. South slopes below an elevation of about 6000 feet have a mesic soil temperature regime and an aridic soil moisture regime. Higher elevation south facing slopes and north facing slopes have a frigid soil temperature regime and xeric soil moisture regime. These landscapes include the fault scarp of the Steens Mountain, and Trout Creek and Pueblo Mountains. The Steens and Pueblo Mountains have formed in basalt while the Trout Creek Mountains have formed in basalt and welded tuff. The primary soils are moderately deep and deep to bedrock. The surface layer is typically very stony loam with a very cobbly loam subsoil. Xeric Haplocambids and Aridic Haploxerolls on south slopes and Pachic Haploxerolls on north slopes dominate this component. The dominant potential natural vegetation consists of mountain big sage, Idaho fescue, bluebunch wheatgrass, western juniper and Sandberg bluegrass.

Compiled By: Thor Thorson, Natural Resources Conservation Service, Nancy
Ketrenos, Bureau of Land Management and Joe Bailey, U.S. Forest Service

342Bh High Desert Lake Basins

Location: This subsection is located in southeastern Oregon.

Subsection Concept: This subsection consists of the Pleistocene lake basins in the basin and range physiographic province. It consists of the basins, bolson floor and adjacent terraces. The major general vegetative type is the salt desert shrub community. This map unit is separated from similar subsections because of its low elevation basin setting. It has generally enclosed drainages containing sediments deposited during periods of glaciation.

Subsection Setting and General Characteristics: These basins have an elevation range of 4300 to 5000 feet (1311 to 1524 meters). The dominant slope range is 0 to 2 percent but ranges up to 12 percent on terrace fronts. The dominant parent material is stratified recent and older alluvium. The primary geomorphic processes in these landscapes are fluvial and lacustrine with water transport and deposition into the lake basins. Fine sediment reworking occurs during infrequent short-lived lake renewal.

Mean annual precipitation ranges from 6 to 8 inches (15 to 20 cms) in the lower elevation basins on the leeward side of adjacent mountain ranges to 8 to 10 inches (20 to 25 cms) in higher elevation basins. Precipitation is mostly in the form of snow, or spring and fall rains. The mean annual air temperature is 44 to 50 degrees F (7 to 10 degrees C).

There are numerous intermittent lakes in spring and summer formed from snowmelt. The depth of the lakes and the duration in which water is present is extremely variable from year to year. As these lakes dry, large non-vegetated playas develop.

The primary natural disturbance process is sediment deposition in the arid basin. Human-caused disturbances include livestock grazing and some marginal irrigated agriculture.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the terraces and the bolson floor.

The terraces are located at the higher elevations and are typically adjacent to the uplands. The dominant slope gradients are 0 to 5 percent. The terrace fronts have slopes up to 12 percent. These landscapes include very deep alluvial deposits which have formed in the older alluvium. The soil moisture regime is aridic and the soil temperature regime is mesic. The primary soils are very deep to bedrock but typically have a hard pan within 40 inches of the soil surface. The surface is typically sandy loam with a loam or clay loam subsoil. The material underlying the hard pan is typically very gravelly loamy sands. Haploxeralfic Argidurids and Xeric Argidurids dominate this landscape component. The dominant potential natural vegetation consists of budsage, shadscale, needleandthread, Sandberg bluegrass, indian ricegrass, spiny hopsage and Wyoming bigsage.

The bolson floor is the lowest position on the landscape with dominant slope gradients from 0 to 2 percent. These landscapes include very deep alluvial deposits which have formed in recent alluvium and lacustrine sediments. The soil temperature regime is mesic. The soil moisture regime is aridic with significant areas having an aquic regime. The primary soils are very deep and are well drained to very poorly drained. Soils that have poor internal drainage and fluctuating water tables are high in salts and sodium. The wettest soils that have perennial water tables are very high in organic matter. Aquic Haploxererts, Aquic Palexeralfs, Xeric Haplocambids, Sodic Haplocambids, Xeric Paleargids, Vitrixerandic Haplocumbids, Aquic Natrargids, Typic Halaquepts, Xeric Torripsamments, Typic Borosaprists and Histic

Humaquepts. The dominant potential vegetation consists of cattails and sedges in very wet areas grading to the salt desert plant communities consisting of budsage, black greasewood, silver sagebrush, needleandthread, Sandberg bluegrass, inland saltgrass, alkali sacaton, basin wildrye, spiny hopsage and Wyoming bigsage.

Compiled By: Thor Thorson, Natural Resource Conservation Service and Joe Bailey, U.S. Forest Service

342Bi High Steens Mountain

Location: This subsection is located in the higher elevations of the Steens, Hart, Pueblo and Trout Creek Mountains in southwestern Oregon.

Subsection Concept: This subsection consists of higher elevations of uplifted fault block mountains and isolated mountain ranges of basalt. The major general vegetation type is shrub-grassland. This map unit is separated from the Low Steens Mountain Subsections based upon its higher elevations. It has colder climatic conditions and has been glaciated.

Subsection Setting and General Characteristics: These mountains have an elevation range of 6500 to 9700 feet (1981 to 2957 meters). The dominant slope range is 15 to 60, but ranges to 2 percent on the upper elevation portion of the dip slope of Steens and Hart Mountains and up to 80 percent on the incised drainages of the Pueblo and Trout Creek Mountains. The dominant type of rock is Miocene basalt. The primary geomorphic process in these landscapes is glaciation with characteristic U-shaped valleys present on the Steens Mountain. Rill and gully erosion have also occurred. Deeply incised drainages are widened by mass wasting mainly in remnant glacial features.

Mean annual precipitation ranges from 16 inches (40 cms) at lower elevations to 50 inches (125 cms) at higher elevations. Precipitation is mainly in the form of snow with spring and fall rains and summer thunderstorms. The mean annual air temperature is 38 to 42 degrees F (3 to 6 degrees C).

There are numerous perennial streams from snowmelt. Aspen groves and mountainmahogany thickets are present in protected areas which accumulate snow.

Human-caused disturbances are mainly livestock grazing with some recreation use.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the highest elevation portion of the Basin and Range Province mountains in Oregon.

This segment of the mountains is located at high elevations with dominant slope gradients from 15 to 60 percent. These mountains include the north-south trending ranges bounded by upthrust blocks and the dip slope of fault block mountains that are formed of basalt. The primary soils are shallow to deep to bedrock. The surface is typically very gravelly loam with a very gravelly or very cobbly loam subsoil. The soil moisture regime is xeric and the soil temperature regime is cryic. Pachic Cryoborolls and Lithic Cryoborolls dominate these areas. The dominant potential natural vegetation consists of rough fescue, Idaho fescue, mountain big sagebrush, low sagebrush, mountainmahogany and aspen.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Joe Bailey, U.S. Forest Service

342Bj High Desert Basalt Plateau

Location: This subsection is a very extensive unit that extends from southeastern Oregon into northwestern Nevada.

Subsection Concept: This subsection consists of nearly level to gently sloping plateaus underlain by basalt. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon its nearly level to gently sloping upland position. It has uniformly flat lying to moderately dipping basalt. Much of the area was covered with paleo lake deposits in valley bottoms.

Subsection Setting and General Characteristics: These plateaus have an elevation range of 4700 to 6000 feet (1433 to 1829 meters). The dominant slope range is 2 to 30 with isolated peaks and canyons ranging up to 60 percent. The dominant type of rock is Miocene basalt. The primary geomorphic processes in these landscapes is colluvial deposition from horst and graben highlands. These are infilling to form gently sloping valley bottoms.

Mean annual precipitation generally ranges from 10 inches (25 cms) to 14 inches (35 cms) for most of the plateaus. The higher peaks, such as Wagontire Mountain, Glass Butte and Fredrick Butte, can range up to 16 inches (40 cms). Precipitation is mainly in the form of snow with spring and fall rains. The mean annual air temperature is 42 to 45 degrees F (6 to 7 degrees C).

There are numerous small basins which contain intermittent water.

The primary natural disturbance process is low intensity fire. Human-caused disturbances are mainly livestock grazing with some recreation use.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the nearly level to gently sloping plateaus and the steep north and south facing slopes. Also included are some small basins.

The nearly level to gently sloping plateaus make up about 75 percent of this unit. These are located on mid-elevation sites with dominant slope gradients from 2 to 30 percent. These plateaus consist of residual and colluvial soil material that has formed from basalt. The soil moisture regime is aridic and the soil temperature regime is frigid. The primary soils are shallow to moderately deep to bedrock. The surface is typically gravelly or very cobbly loam with a subsoil of clay loam or clay overlying th bedrock. Lithic Argixerolls, Xeric Haplodurids, Xeric Argidurids, Lithic Xeric Haplargids, Xeric Haplocambids and Aridic Argixerolls dominate this component. The dominant potential natural vegetation consists of bluebunch wheatgrass, Sandberg bluegrass, Wyoming big sagebrush, low sagebrush and Idaho fescue.

The steep north and south facing mountain slopes occur as prominent peaks across the nearly level to gently sloping landscapes and make up about 20 percent of the unit. They are located on mid-elevation sites with dominant slope gradients from 30 to 60 percent. These slopes consist of residual and colluvial soil materials that have formed from basalt. The soil temperature regime is frigid on both north and south facing slopes. The soil moisture regime is aridic on the south facing slopes and xeric on north facing slopes. The primary soils are moderately deep to deep to bedrock. The surface is typically very gravelly to very stony loam with a very cobbly to extremely cobbly clay loam subsoil. Pachic Haploxerolls dominate the north facing slopes and Aridic Haploxerolls dominate the south facing slopes. The dominant potential natural vegetation consists of bluebunch wheatgrass, Sandberg bluegrass, mountain big sagebrush and Wyoming big sagebrush on the south facing slopes and Idaho fescue, bluebunch wheatgrass and big sagebrush on the north facing slopes.

There are numerous small basins which contain intermittent water in the spring and early summer. These basins are typically less than 10 acres in size and comprise less than 5 percent of the unit. These basins are typically dry in the fall. As these basins dry, vegetation becomes established. These basins perch water because of a clay layer at or near the surface. Aquic Haploxererts and Aquic Palexeralfs dominate this component. The dominant potential natural vegetation consists of silver sagebrush, Nevada bluegrass, mat muhly and creeping wildrye.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Joe Bailey, U.S. Forest Service

342Ca Owyhee Basalt Plain

Subsection Concept: High basalt lava plateau dissected to form badland physiographic properties.

Physiographic Properties

Geomorphology: Slightly dissected volcanic plains and buttes with both interior and external drainage. Deeply incised by the Owyhee River.

Elevation: 5000-5500 feet.

Lithologic Properties

Lithology/Stratigraphy: Complex series of overlapping volcanic calderas of immense size erupted during the Miocene producing vast ash flowtuffs and rhyolites which are overlain by basalts.

Climatic Properties:

Precipitation: 8-13 inches. Aridic and aridic/xeric soil moisture regimes.

Temperature: 47-50 degrees F. Mesic with small areas of frigid soil temperature regimes.

Growing Season: 70-120 frost-free days.

Associated Characteristics

Soil Taxa: Xerollic Durargids, Xerollic Haplargids, Lithic Xerollic Haplargids, Abruptic Xerollic Durarigids, Durixerollic Haplargids.

Potential Natural Vegetation: Loamy sites (Wyoming big sagebrush, Thurber needlegrass, bluebunch wheatgrass, Sandberg bluegrass), Shallow-clayey sites (log sagebrush, bluebunch wheatgrass, Idaho fescue).

Surface Water Characteristics: Few rivers, common perennial streams, many ephemeral streams/draws.

Disturbance Regimes: Fire.

Land Use: Livestock grazing, mining, recreation.

Compiled By: Paul Seronko, Boise District, BLM.

342Cb Snake River Plain

Subsection Concept: Alluvial fans, terraces, and low plateaus associated with the Snake River plains.

Physiographic Properties

Geomorphology: Fluvial, eolian, and areas of mass wasting. Slope: 3-30 percent.

Elevation: 2300-5400 feet. Aspect: north with east and west. Little south.

Lithologic Properties

Lithology/Stratigraphy: Miocene olivine basalt flows and upper Miocene to Pliocene lacustrine sediments of the Idaho group. Areas of the Bruneau formation (plisticene) and Flenns Ferry formation.

Climatic Properties:

Precipitation: 6-13 inches. Aridic and aridic/xeric soil moisture regimes. The majority of this precipitation comes as rain.

Temperature: 48-52 degrees F. Mesic soil temperature regime.

Growing Season: 100-150 frost-free days.

Associated Characteristics

Soil Taxa: Durarigids, Haplarigids, Calciorthis, Durorthis, with some Torriorthents.

Potential Natural Vegetation: Loamy sites (Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass); silty sites (winterfat, Indian ricegrass, needlegrass); calcareous sites (shadescale, Indian ricegrass, bottlebrush squirreltail).

Surface Water Characteristics: Few perennial streams, many ephemeral streams/draws.

Disturbance Regimes: Fire and erosion (both wind and water).

Land Use: Livestock grazing, agriculture, recreation, development.

Compiled By: Paul Seronko, Boise District, BLM.

342Cc Owyhee Tablelands

Subsection Concept: Cool dissected tablelands and associated plains.

Physiographic Properties

Geomorphology: Dominantly fluvial (dissected basalt plains) with area mass wasting. Slope: 1-30 percent.

Elevation: 5000-6200 feet. Aspect: variable.

Lithologic Properties

Lithology/Stratigraphy: Late miocene and pliocene olivine basalt and welded tuff.

Climatic Properties:

Precipitation: 13-16 inches. Xeric soil moisture regime.

Temperature: 41-45 degrees F. Frigid with some mesic soil temperature regime.

Growing Season: 70-90 frost-free days.

Associated Characteristics

Soil Taxa: Typic Durixeralfs, Lithic Mollic Haploxeralfs, Vitrandic Argixerolls.

Potential Natural Vegetation: Loamy sites (mountain big sagebrush, Idaho fescue, bluebunch wheatgrass), shallow-claypan sites (low sagebrush, Idaho fescue, bluebunch wheatgrass).

Surface Water Characteristics: Associated with the Owyhee river system. Very few rivers, common perennial streams, many ephemeral streams/draws.

Disturbance Regimes: Fire.

Land Use: Livestock grazing, recreation, mining.

Compiled By: Paul Seronko, Boise District, BLM.

342Cd Bruneau Plateau

Subsection Concept: Foothills, structural benches, and remnant calderas associated with the Bruneau River system. Areas deeply incised by the Bruneau River.

Physiographic Properties

Geomorphology: Fluvial with eolian influence. Isolated mass wasting.

Elevation: 4000-5500 feet.

Lithologic Properties

Lithology/Stratigraphy: Late Miocene and Pliocene olivine basalt, welded tuff, and ash. Influenced by the sedimentary Bruneau formation (Plistocene) and Glens Ferry formation.

Climatic Properties:

Precipitation: 10-14 inches. Aridic/xeric soil moisture regime.

Temperature: 48-52 degrees F. Mesic with small areas of frigid soil temperature regimes.

Growing Season: 80-135 frost-free days.

Associated Characteristics

Soil Taxa: Xerollic Durargids, Xerollic Haplargids. Dominated by shallow and moderately deep soils.

Potential Natural Vegetation: Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, Sandberg bluegrass.

Surface Water Characteristics: Very few rivers, few perennial streams, many ephemeral streams/draws.

Disturbance Regimes: Fire and subsequent invasion of annual exotic species.

Land Use: Livestock grazing, agriculture, recreation.

Compiled By: Paul Seronko, Boise District, BLM.

342Ce Snake River Bottomlands

Location: This subsection is located in eastern Oregon along the border with Idaho.

Subsection Concept: This subsection consists of terraces and flood plains of the Snake River. The major general vegetative type is grassland. This map unit is separated from adjacent subsections based upon the presence of the large volcanic plain. Most of the surrounding subsections are bedrock controlled landscapes.

Subsection Setting and General Characteristics: These terraces and flood plains have an elevation range of 2100 to 3200 feet (640 to 975 meters). The dominant slope range is 0 to 8 percent. The dominant geologic material is stratified recent and older alluvium. The primary geomorphic processes in these landscapes is fluvial with water transport and deposition of sediment.

Mean annual precipitation generally ranges from 8 inches (20 cms) at lower elevations to 11 inches (28 cms) at higher elevations. Precipitation is primarily in the form of rain which occurs mostly from October through June. The mean annual air temperature is 49 to 52 degrees F (9 to 11 degrees C).

The Snake River is the main stream in the subsection. Associated with it is extensive irrigation, both sprinkler and furrow.

The main human-caused disturbances are associated with agriculture and include such practices as land leveling or smoothing, and ripping of the subsoil.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the flood plains and the terraces.

The floodplains are located on the lowest elevational portions of the landscape with dominant slope gradients of 0 to 2 percent. This landscape component consists of stream channels and associated flood plains which have formed in recent alluvium. The soils have a mesic soil temperature regime and an aquic or aridic soil moisture regime. The primary soils are very deep and are well drained to poorly well drained. Soils having poor internal drainage and fluctuating seasonal water tables contain salts and sodium. The surface is typically silt loam with silt loam and sandy loam subsoils. Typic Endoaquolls, Typic Halaquepts, Aquic Xerofluvents and Aquic Xerorthents dominate the landscape. Flooding is rare or occasional due to flood control structures on the Snake River. The dominant potential natural vegetation consists of Thurber needlegrass, Sandberg bluegrass, bluebunch wheatgrass, Wyoming big sagebrush, along with basin wildrye, inland saltgrass and black greasewood on the sodic soils.

The terraces are located on the higher elevational portions of the landscape with dominant slope gradients of 0 to 8 percent. This landscape component consists of the terrace tops and escarpments which have formed in older alluvium. The primary soils are very deep to bedrock but typically have a hardpan within 40 inches of the soil surface. The soils have a mesic soil temperature regime and an aridic soil moisture regime. The surface is typically silt loam with silt loam and silty clay loam subsoils. The material underlying the hardpan consists of stratified sand to silt loam with variable amounts of gravel. Xeric Calciargids, Xeric Haplocambids, Xeric Haplodurids, Xeric Argidurids and Abruptic Xeric Argidurids dominate the landscape. The dominant potential natural vegetation consists of Thurber needlegrass, Sandberg bluegrass, bluebunch wheatgrass and Wyoming big sagebrush.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Joe Bailey, U.S. Forest Service

342Cg Owyhee Uplands

Subsection Concept: Mountains and foothills of welded tuff, basalt, and intermediate igneous rock.

Physiographic Properties

Geomorphology: Deeply dissected uplands, dominated by fluvial erosion processes with associated mass wasting.

Elevation: 4800-8200 feet. Aspect: dominantly north and south with proportional east and west.

Lithologic Properties

Lithology/Stratigraphy: Welded tuffs, Miocene basalts, and granitic formations. Structurally, the area is uplifted and doming and block faulting are common (strong north/south fault system).

Climatic Properties:

Precipitation: 13-32 inches. At higher elevations most of this comes as snow. Xeric soil moisture regime.

Temperature: 34-45 degrees F. Dominantly frigid with some mesic and cryic soil temperature regimes.

Growing Season: 30-95 frost-free days.

Associated Characteristics

Soil Taxa: Argixerolls and Cryoborolls.

Potential Natural Vegetation: Mountain big sagebrush, Idaho fescue, bluebunch wheatgrass on foothills and mountains; Douglas-fir woodlands on north facing mountain slopes; included areas of low sagebrush, mountain shrub, aspen, mountain mahogany, western juniper, riparian, and wet meadow communities.

Surface Water Characteristics: Very few rivers, common perennial streams, many ephemeral streams. Major characteristic is the Owyhee River.

Disturbance Regimes: Fire. Encroachment of juniper.

Land Use: Livestock grazing, mining, and recreation.

Compiled By: Paul Seronko, Boise District, BLM.

342Ch Owyhee Foothills

Location: This subsection is located in northern Malheur County, Oregon.

Subsection Concept: This subsection consists of rolling tuffaceous hills and basalt plateaus and hills dissected by numerous small drainageways. The major general vegetation type is shrub-grassland. This subsection is separated from the adjacent subsections based on landform, geology and climate. The adjacent Snake River Plain subsection to the east has a landscape comprised of terraces and floodplains. The Jordan Craters subsection to the south has less relief and contains large areas of exposed lava. The Drewsey-Hampton Grassland subsection to the west has a more moist and cooler climate. The Owyhee Uplands subsection to the southeast has more relief.

Subsection Setting and General Characteristics: These hills and plateaus have an elevational range of 2500 to 5000 feet (762 to 1524 meters). Isolated peaks extend up to about 6500 feet. The dominant slope range is 2 to 60 percent. The alluvial bottoms have a slope range of 0 to 3 percent. The dominant type of rock is basalt in the southern portion of the unit and tuffaceous sediments in the northern portion. The primary geomorphic process in this landscape is erosion.

Mean annual precipitation ranges from 9 inches (23 cms) at lower elevations to 12 inches (30 cms) at higher elevations. Precipitation is mainly in the form of snow with spring and fall rains. The mean annual air temperature is 45 to 50 degrees F (7 to 11 degrees C).

There are numerous perennial and intermittent drainageways throughout the subsection.

The primary natural disturbance process is fire. Human-caused disturbances are primarily livestock grazing, mining, and irrigated agriculture along the drainageways.

Subsection Ecological Relationships

This subsection consists of three primary landscape components: the rolling tuffaceous hills, basalt plateaus and hills, and alluvial bottoms. The soil temperature regime is mesic and the soil moisture regime is aridic in all of them.

The rolling tuffaceous hills make up about 45 percent of the subsection. This component is within the northern portion of the unit. The dominant slope gradient is 5 to 60 percent. The hills consist of gently sloping hills summits and footslopes and the more steeply sloping sideslopes. The primary soils are shallow, moderately deep and deep. The rock is soft when compared with the basalt. The surface layer is typically loam or silt loam with loam and clay loam subsoils. The landscape contains numerous exposures of the tuffaceous sediments (badlands). Aridic Calcic Argixerolls, Lithic Haploxerolls, Xeric Paleargids and Aridic Haploxerolls dominate this landscape component. The dominant potential natural vegetation consists of Wyoming big sagebrush, low sagebrush, Sandberg bluegrass, bluebunch wheatgrass and Idaho fescue.

The basalt plateaus and hills make up about 45 percent of the subsection. This subsection component is primarily within the southern portion of the unit. The dominant slope gradient is 2 to 60 percent. The nearly level to gently sloping plateaus have slopes of 2 to 20 percent. The sideslopes of the hills have slopes of over 20 percent. The primary soils are shallow and moderately deep to bedrock. The surface layer is very gravelly loam with very gravelly loam or clay loam subsoils. Andic Argixerolls, and Lithic Argixerolls dominate the nearly level plateaus. Aridic Haploxerolls, Lithic Haploxerolls and Xeric Haplocambids dominate the steeper sideslopes. The dominant potential natural vegetation consists of Wyoming big sagebrush, low

sagebrush, Sandberg bluegrass, bluebunch wheatgrass and Idaho fescue.

The alluvial bottoms make up about 10 percent of the subsection. The landscape consists of incised floodplains formed in very deep alluvium. The dominant slope gradient is 0 to 3 percent. The primary soils are very deep to bedrock. Flooding occurs occasionally to rarely. Water tables are present in the late winter and spring and are absent in late summer and fall. The surface layer is typically silt loam with a stratified silt loam or fine sandy loam subsoil. Soils that have poor internal drainage exhibit saline and alkali limitations. C mulic Haploxerolls, Xeric Torriorthents and Typic Halaquepts dominate the landscape component. The dominant potential natural vegetation consists of basin wildrye, basin big sagebrush, inland saltgrass and black greasewood.

Compiled by: Thor Thorson, Natural Resources Conservation Service

342Ci Jordan Craters

Location: This subsection is located in extreme southeastern Oregon.

Subsection Concept: This subsection consists of Holocene age basalt lava flows. Much of this unit is devoid of vegetation and soil. The major vegetation type is shrub-grassland with significant areas of exposed lava. This subsection is separated from adjacent subsections based on the unique geologic landscape and the extensive exposure of lava.

Subsection Setting and General Characteristics: This subsection consists of a nearly level to gently sloping lava plain having an elevation range of 3500 to 5000 feet (1067 to 1524 meters). The dominant slope range is 0 to 10 percent. The dominant type of rock is basalt. The primary geomorphic process in this landscape is erosional.

Mean annual precipitation ranges from 9 inches (23 cms) at lower elevations to 12 inches (32 cms) at higher elevations. Precipitation is in the form of snow with spring and fall rains and occasional summer thunderstorms. The mean annual air temperature is 44 to 50 degrees F (9 to 11 degrees C).

Water is generally lacking because of the very rapid infiltration of water into the bedrock. The Owyhee River dissects the subsection.

Human-caused disturbances include livestock grazing and recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component, the lava flows.

This landscape consists of nearly level to gently sloping lava flows mantled with a minimal amount of soil and supporting minimal vegetation. This recent geologic landscape along with the minimal amount of moisture has limited the development of the landscape. The soil temperature regime is mesic and the soil moisture regime is aridic. The primary soils are very shallow and shallow to edrock. The surface is typically very stony loam with a very cobbly or ery stony loam or clay loam subsoil. Lithic Xeric Haplargids and Lithic Xeric aplocambids dominate the landscape along with the exposed lava. The dominant otential natural vegetation consists of Thurber needlegrass, Sandberg luegrass, bluebunch wheatgrass, Wyoming big sagebrush and low sagebrush.

Compiled by: Thor Thorson, Natural Resources Conservation Service

342Da Upper Snake River Lava Plains and Hills

Location: This subsection is located in the Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection consists of lava plains associated with the Snake River Basalts that have been slightly modified by eolian processes. The major general vegetative types include a shrub-grass association. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These lava plains and hills have an elevation range of 1300 to 6550 feet/400 to 2000 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are volcanic. The primary geomorphic process in these landscapes are eolian. Mean annual precipitation ranges from 10 inches/25 cms) to 20 inches/50 cms). Most precipitation occurs in the spring and autumn with 70 percent of the precipitation falling as snow. The mean annual air temperature is 39 to 55 degrees F/4-13 degrees C).

Infrequent streams and rivers drain into sinks.

The primary natural disturbance process is fire. Human-caused disturbances include grazing. A portion of the Idaho National Engineering Laboratory and Craters of the Moon National Monument are located in this subsection.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes lava plains and hills.

The lava plains and hills are located on all elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include volcanic plain landforms that are overlain by eolian materials. The primary soils are shallow to deep and moderately fine textured to fine textured. These soils are classified as Argixerolls, Haploxerolls and Durargids. The dominant potential natural vegetation is big sagebrush and bluebunch wheatgrass on moderately deep to very deep soils and on steep and very steep south exposures. Big sagebrush and Idaho fescue are dominant on moist sites. Stiff sagebrush, low sagebrush and Sandberg bluegrass are dominant on drier sites. Antelope bitterbrush and Idaho fescue grow on moist sites at high elevations. Western juniper is common on the drier, stonier sites. Curlleaf mountain mahogany grows at high elevations.

Comments: This delineation consists of Major Land Resource Area (MLRA) number 10.

Compiled By: Targhee National Forest; Terry Bowerman, Jim Dorr and Terry Craig.

342Db Southern Idaho Plateaus

Location: This subsection is located in the Snake River Basin of southern Idaho.

Subsection Concept: This subsection consists of lava plains associated with the Snake River Basalts. These have been scoured by fluvial processes and overlain by alluvial and lacustrine deposits. The major general vegetative types include deciduous forest, grasslands and shrublands. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These alluvial plains have an elevation range of 4600 to 5000 feet/1400 to 1500 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are sedimentary. The primary geomorphic processes in these landscapes are fluvial and eolian. Mean annual precipitation ranges from 8 inches/20 cms to 12 inches/30 cms. Most precipitation occurs in the spring and autumn with 70 percent of the precipitation falling as snow. The mean annual air temperature is 39 to 45 degrees F/4-7 degrees C.

The Snake River drains this subsection.

The primary natural disturbance processes are fire and flooding. Human-caused disturbances include agriculture, grazing and mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes alluvial plains.

The alluvial plains are located on all elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include scoured lava plains that are overlain by eolian materials. The primary soils are deep with moderately coarse and medium textures. These soils are classified as Argixerolls, Calcixerolls and Haploxerolls. The dominant potential natural vegetation is big sagebrush, bluebunch wheatgrass. Arrowleaf balsamroot, prairie junegrass, Sandberg bluegrass, Nevada bluegrass, oniongrass and slender wheatgrass are present on different sites.

Comments: This delineation consists of Major Land Resource Area (MLRA) number 13.

Compiled By: Targhee National Forest; Terry Bowerman, Jim Dorr and Terry Craigg

342Dc Lost River Valleys

Location: This subsection is located in the Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection consists of lava plains associated with the Snake River Basalts. These are overlain by alluvium and lacustrine deposits. The major general vegetative types include desert shrub and shrub-grass vegetation. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These valleys and mountains have an elevation range of 4600 to 6550 feet/1400 to 2000 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are mixed sedimentary and volcanic. The primary geomorphic processes in these landscapes are fluvial and eolian.

Mean annual precipitation ranges from 7 inches/17 cms to 11 inches/27 cms. Most precipitation occurs in the spring and autumn with 70 percent of the precipitation falling as snow. The mean annual air temperature is 37 to 45 degrees F/3-7degrees C.

Infrequent streams and rivers typically drain into sinks.

The primary natural disturbance process is fire. Human-caused disturbances include agriculture and grazing. A portion of the Idaho National Engineering Laboratory is located in this subsection.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes alluvial valleys.

The alluvial valleys are located on all elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include alluvial fan and stream terrace and bolsom landforms that are formed in recent alluvium and some lacustrine deposits. The primary soils are deep with moderately coarse textures. These soils are classified as Calciorthids, Torriorthents, Haplaquolls and Argixerolls. The dominant potential natural vegetation is desert shrub and shrub-grass. Indian ricegrass, needleandthread, shadscale, gardner saltbush, and scarlet globemallow are major species in the valleys. Big and low sagebrush, winterfat, bluebunch wheatgrass, Sandberg bluegrass, and a variety of forbs grow on mountain foot slopes.

Comments: This delineation consists of Major Land Resource Area (MLRA) number 12.

Compiled By: Targhee National Forest; Terry Bowerman, Jim Dorr and Terry Craigg.

342Dd Eastern Idaho Plateaus

Location: This subsection is located in the Snake River Basin of southern Idaho.

Subsection Concept: This subsection consists of lava plains associated with the Snake River Basalts that have been slightly modified by eolian processes. The major general vegetative types include a shrub-grass association. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These plateaus have an elevation range of 4600 to 6550 feet/1400 to 2000 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are sedimentary and volcanic. The primary geomorphic processes in these landscapes are fluvial, residual and eolian. Mean annual precipitation ranges from 12 inches/30 cms to 24 inches/62 cms. Most precipitation occurs in the spring and autumn with 70 percent of the precipitation falling as snow. The mean annual air temperature is 39 to 45 degrees F/4-7 degrees C.

Streams and rivers in the western portion of the subsection drain into sinks. In the eastern portion, the Teton River, Fall River and the Henrys Fork of the Snake River cross the subsection.

The primary natural disturbance process is fire. Human-caused disturbances include agriculture, grazing and recreation. The St. Anthony Sand Dunes are located in this subsection.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes volcanic plateaus.

The volcanic plateaus are located on all elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include volcanic plateau landforms that are overlaid by eolian materials. The primary soils are deep and moderately deep with moderately coarse textures. These soils are classified as Argixerolls and Haploxerolls on the aeolian plains and Cryoborolls on alluvial fans and terraces near the mountains. The dominant potential natural vegetation is big sagebrush, bluebunch wheatgrass. Arrowleaf balsamroot, prairie junegrass, Sandberg bluegrass, Nevada bluegrass, oniongrass and slender wheatgrass are present on different sites.

Comments: This delineation consists of Major Land Resource Area (MLRA) number 13.

Compiled By: Targhee National Forest; Terry Bowerman, Jim Dorr and Terry Craig

342De Snake River Plains

Location: This subsection is located in the Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection consists of lava plains associated with the Snake River Basalts that have been slightly modified by eolian processes. The major general vegetative types include shrub-grass association. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These Plains have an elevation range of 1950 to 5600 feet/600 to 1700 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are volcanic. The primary geomorphic process in these landscapes are eolian. Mean annual precipitation ranges from 7 inches/17 cms to 13 inches/32 cms. Most precipitation occurs in the spring and autumn with 70 percent of the precipitation falling as snow. The mean annual air temperature is 41 to 52 degrees F/5-11 degrees C).

Streams, rivers and sinks are infrequent.

The primary natural disturbance process is fire. Human-caused disturbances include grazing. A portion of the Idaho National Engineering Laboratory is located in this subsection.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes lava plains.

The lava plains are located on all elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include volcanic plain landforms that are overlaid by eolian materials. The primary soils are deep and moderately deep with moderately coarse texture. These soils are classified as Calciorthids, Haplargids, Camborthids, Durorthids, Torriorthents and Calcixerolls. The dominant potential natural vegetation is big sagebrush, winterfat, shadscale, Indian ricegrass, needleandthread, Thurberneedlegrass and bluebunch wheatgrass.

Comments: This delineation consists of Major Land Resource Area (MLRA) number 11.

Compiled By: Targhee National Forest; Terry Bowerman, Jim Dorr and Terry Craigg.

342Df Snake River Plains and Buttes

Location: This subsection is located in the south-central Idaho, extending from Minidoka, Idaho to Bliss Point, Idaho.

Subsection Concept: This subsection consists of lava flows, lava plains, and buttes that occur in the central Snake River Plains. These plains and buttes were formed from basalt flows, with associated tuffs and volcanic detritus of Pliocene and Pliocene origin. Some Quaternary alluvium also exists along the Snake River benches. The major general vegetative types include sagebrush steppe through out this subsection. This map unit is separated from similar subsections based upon differences in geologic parent materials and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These lava plains and buttes have an elevation range of 2,800 to 4,600 feet/853 to 1,402 meters. The dominant slope range is 0 to 15 percent. The dominant types of rocks are basalt flows, welded tuffs, Quaternary alluvium along the Snake River. The primary geomorphic processes in these landscapes are volcanic and extrusive basalt flows that formed the plains and buttes in the Snake River Valley. Wind blown deposits cover the surfaces on the outer edges of the Snake River plain.

Mean annual precipitation ranges from 10 inches/254 mm at lowest elevations to 20 inches/508 mm at the highest elevations. Precipitation is evenly distributed throughout the fall winter and spring but low in the summer. The mean annual air temperature is 39 to 55 degrees F/4.0 to 13.0 degrees C.

The major streams that occur in this subsection are usually deeply entrenched and include the Snake River, and Wood River. Irrigation canals have also been constructed through the subsection. Ground water is available in some areas. The landscape is slightly dissected.

The primary natural disturbance processes are fire and flooding. Fire occurred historically every 25 to 30 years on the sagebrush covertypes. Human-caused disturbances include grazing and agriculture.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include lava plains and buttes.

The lava plains are located on the lowest elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include rolling hills and swales that are formed from basalt flows and welded tuff parent materials. The primary soils are shallow to very deep and well drained. Surface textures are generally silt loam. These soils are classified as Durixerollic Calciorthids and Xerollic Calciorthids or Durothids associated with big sagebrush and bluebunch wheatgrass potential natural vegetation.

The buttes are located on highest elevation sites with dominant slope gradients from 5 to 25 percent. These landscapes include buttes and hills that formed from extrusive volcanic flows. The primary soils are generally shallow to very deep and well drained. Surface textures are silt loam or loam. These soils are classified as a miscellaneous land type of rockland and rough broken land.

Compiled By: Caribou National Forest

342Ha Kimberly-Paulina Hills

Location: This subsection is located in Crook County in Central Oregon.

Subsection Concept: This subsection consists of the rolling shrub-grassland hills in the Ochoco Mountains. The subsection is between the higher forested subsection units and the nearly level High Desert Basalt Plateau subsection.

Subsection Setting and General Characteristics: This subsection consists of rolling hills underlain by basalt. They have an elevation range of 4000 to 6000 feet (1219 to 1829 meters). The north slopes at higher elevations are forested. The dominant slope range is 5 to 60 percent. The narrow alluvial bottoms have slopes of 0 to 3 percent. The primary geomorphic process is erosional.

Mean annual precipitation ranges from 12 inches (30 cms) at lower elevations to 20 inches (50 cms) at the higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 43 to 47 degrees F (6 to 8 degrees C).

There are numerous intermittent drainageways that feed water into the Crooked River that borders this unit on the south.

The primary natural disturbance is fire. Human-caused disturbances include livestock grazing and irrigated agriculture on the alluvial bottoms.

Subsection Ecological Relationships

This subsection consists of two primary landscape components: the rolling shrub-grassland hills and the narrow alluvial bottoms.

The hills are located at mid-elevation sites with dominant slope ranges of 5 to 60 percent. The landscapes include hill summits, footslopes and sideslopes that have formed in weathered basalt. The soil moisture regime is primarily xeric with low elevation south slopes being aridic. The soil temperature regime is frigid. The primary soils are moderately deep and shallow to bedrock. The surface layer is typically very cobbly loam with a very cobbly loam or clay loam subsoil. Typic Argixerolls, Pachic Argixerolls and Lithic Argixerolls dominate the landscape. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, snowberry and mountain big sagebrush. Western juniper has invaded most areas because of the suppression of fires. The higher elevation north slopes are forested with ponderosa pine as the dominant tree. This segment of the landscape is dominated by Ultic Argixerolls and Pachic Ultic Argixerolls.

The alluvial bottoms are located at low elevation sites with dominant slopes of 0 to 3 percent. This landscape includes floodplains with incised drainages. The soil moisture regime is xeric with poorly drained areas having an aquic moisture regime. The soil temperature regime is mexic. The primary soils are very deep to bedrock. Flooding is occasional on the lower terraces and ranges from rare to none on the higher terraces. On the lower terraces the surface layer is typically gravelly loam or silt loam with the subsoil and substratum being stratified sand and gravel. This segment of the landscape is dominated by Cumulic Haploxerolls and Cumulic Haplaquolls. The dominant potential natural vegetation consists of red top, bluegrass, sedges and willows. On the higher terraces the surface layer is typically loam with a loam or clay loam subsoil. This segment of this landscape is dominated by Calcic Argixerolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Sandberg bluegrass, basin wildrye and basin big sagebrush.

Compiled by: Thor Thorson, Natural Resources Conservation Service

342Hb John Day-Clarno Hills

Location: This subsection is located in central Oregon.

Subsection Concept: This subsection consists of grassland areas on the John Day and Clarno geologic formation. This map unit is separated from similar subsections based upon the grassland vegetation and the geologic material. The soils and landforms have developed on the sedimentary John Day and Clarno formations.

Subsection Setting and General Characteristics: These grassland areas occur on moderately dissected plateaus and rolling hills. They have an elevation range of 1500 to 4500 feet (457 to 1371 meters). The dominant slope range is to percent. The dominant types of geologic materials are the John Day and Clarno formations. The primary geomorphic process in these landscapes is fluvial with stream downcutting into the plateaus and hills.

Mean annual precipitation generally ranges from 9 inches (23 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is primarily in the form of spring and fall rains with snow in the winter. The mean annual air temperature is 45 to 50 degrees F (7 to 10 degrees C).

There are few rivers and perennial streams, but many ephemeral streams including Bridge Creek, Trout Creek, and the middle segment of the John Day River. Also included are the Prineville and Ochoco Reservoirs.

The primary natural disturbance process is fire. The main human-caused disturbance is livestock grazing. Due to the suppression of fire, western juniper has invaded many of the plant communities.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the plateaus and rolling hills.

These plateaus and rolling hills are located at mid-elevations with dominant slope gradients of 10 to 40 percent. These landscapes consist of soils formed predominantly in residual and colluvial materials that have formed in materials weathered from the John Day and Clarno formations. Included are significant areas of basalt. The soil temperature regime is mesic with the higher elevation north-facing slope being frigid. The soil moisture regime is xeric and also aridic with the break being at about 12 or 14 inches. The primary soils are very deep and deep to bedrock. The surface is typically very stony loam with clay loam and clay subsoils. The soils at the lower elevations having an aridic moisture regime with annual precipitation of less than 12 inches (30 cms) include Aridic Palexerolls, Chromic Haploxererts, Xeric Paleargids, Aridic Argixerolls, Aridic Haploxerolls and Lithic Argixerolls. The soils at the higher elevations having a xeric moisture regime with annual precipitation of 14 or more inches (35 cms) include Lithic Argixerolls, Calcic Pachic Argixerolls and Pachic Palexerolls. The soils derived from basalt are shallow to moderately deep to bedrock. The surface is typically very cobbly loam with a very cobbly clay loam subsoil. Lithic Argixerolls and Aridic Argixerolls dominate the landscape over the basalt. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, antelope bitterbrush, Wyoming big sagebrush and western juniper.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Carrie Gordon, Ochoco National Forest

342Hc Bend-Redmond Plain

Location: This subsection is located in central Oregon and extends from the Agency Plain north of Madras to Bend.

Subsection Concept: This subsection consists of ash deposits over a nearly level to gently sloping basalt lava plain. It occurs in the fallout zone of the fine and medium sand sized ash from Mount Mazama. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon the deposition of sand sized ash on lower elevational basalt plains.

Subsection Setting and General Characteristics: This ash mantled plain has an elevation range of 2000 to 4000 feet (610 to 1219 meters). The dominant slope range is 0 to 15 percent. The dominant types of geologic materials are volcanic ash over basalt. The primary geomorphic process in these landscapes is the deposition of the ash over basalt. Intermittent streams are also actively downcutting to pre-eruption base levels.

Mean annual precipitation generally ranges from 8 inches (20 cms) at lower elevations to 12 inches (30 cms) at higher elevations. Precipitation is primarily in the form of rain from November through March with numerous snowfall events in the winter. The mean annual air temperature is 47 to 52 degrees F (8 to 11 degrees C).

There are numerous irrigation canals. Water infiltration and permeability is rapid because of the coarse textured soil material.

The primary natural disturbance process is wind erosion and fire. The main human-caused disturbances are associated with agriculture and includes irrigated cropland and pastureland, and grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the nearly level to gently sloping basalt lava flow overlain by Mt Mazama ash.

This plain is located at low elevations with dominant slope gradients from 0 to 15 percent. This landscape is geologically recent (younger than 7,000 years) having developed since the eruption of Mt Mazama. For this reason, landscape development is only beginning in these areas. The primary soils are shallow and moderately deep to bedrock. The surface is typically sandy loam and loamy sand with loam, sandy loam or loamy sand subsoils. The soils moisture regime is aridic and the soil temperature regime is mesic. North of Madras on the Agency Plain the soils are medium textured Aridic Haploxerolls, Aridic Argixerolls and Lithic Argixerolls. The soils in the vicinity of Bend to Redmond and north to Madras are warm, coarse textured Vitritorrandic Haploxerolls, Lithic Haploxerolls and Lithic Torripsamments. Numerous small basalt rock outcroppings are present throughout the area. The soils have a higher than expected water holding capacity because of the ashy soil material. The dominant potential natural vegetation consists of Idaho fescue, antelope bitterbrush, needleandthread, bluebunch wheatgrass, western juniper and mountain big sagebrush

Compiled By: Thor Thorson, Natural Resources Conservation Service

342Hd Millican Valley

Location: This subsection is located in central Oregon and extends from Horse Ridge east to Hampton.

Subsection Concept: This subsection consists of a Pleistocene lake basin mantled by volcanic ash. It occurs in the fallout zone of medium sand sized ash from Mount Mazama, with some ash from the Newberry Volcano. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon the basin topography and the presence of the ash.

Subsection Setting and General Characteristics: This ash mantled basin has an elevation range of 4200 to 4800 feet (1280 to 1463 meters). The dominant slope range is 0 to 8 percent. The dominant types of geologic materials are thick, volcanic ash over old stratified alluvium. The primary geomorphic processes in these landscapes have been aeolian with the ash deposition and fluvial with the alluvial deposition.

Mean annual precipitation generally ranges from 8 inches (20 cms) to 11 inches (28 cms). Precipitation is mostly in the form of snow with spring and fall rains. The mean annual air temperature is 43 to 45 degrees F (6 to 7 degrees C).

Water infiltration and permeability are rapid because of the coarse textured soil material.

The primary natural disturbance process is fire. The main human-caused disturbances are associated with livestock grazing and marginal irrigated hayland.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the ash mantled basin.

This basin is located at mid-elevations with dominant slope gradients of 0 to 8 percent. This landscape is geologically recent having formed about 6700 years ago when Mt. Mazama erupted. The recent volcanic activity and limited amount of precipitation explain the limited landscape development. The soil moisture regime is aridic and the soil temperature regime is frigid. The primary soils are deep and very deep to bedrock. The surface is typically loamy sand or sandy loam with a loamy sand subsoil. Where the ash material is less than 60 inches deep, clay loam textures and hardpans are present. This contrasting material is associated with the lake basin sediments. The soils are coarse textured and classified as Vitritorrandic Haploxerolls and Vitritorrandic Durixerolls. The soils have a higher than expected water holding capacity because of the ashy soil material. The dominant potential natural vegetation consists of Idaho fescue, mountain big sagebrush, western needlegrass and Thurber needlegrass.

Compiled By: Thor Thorson, Natural Resources Conservation Service

342Ia Richland Lake Basin

Location: This subsection is located in the Columbia River drainage in southcentral Washington.

Subsection Concept: This subsection consists of a basin containing slack water deposits associated with Glacial Lake Missoula floods. The major general vegetative type is grassland. This map unit is separated from similar subsections based upon the flood deposits.

Subsection Setting and General Characteristics: This basin has an elevation range of 200 to 1200 feet (61 to 366 meters). The dominant slope range is 0 to 20 percent. The dominant type of rock is basalt. The primary geomorphic process in these landscapes is fluvial and associated with flood waters from Glacial Lake Missoula.

Mean annual precipitation ranges from 6 inches (15 cms) at lower elevations to 15 inches (38 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 48 to 53 degrees F (8 to 12 degrees C).

Most surface water is associated with the Columbia River and potholes.

The primary natural disturbance process is wind. Human-caused disturbances include grazing and non-irrigated agriculture. Wind erosion can occur associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the basin:

The basin is located on low elevation sites. The landscape includes nearly level terraces with some dunes and drainage coulees. These landforms have formed in water deposited sediments over basalt. The primary soils are forming in glaciofluvial deposits consisting of sorted sand, silt and gravel. Included are finer lacustrine sediments. The northern portion of this unit is dominantly sand and gravel flood deposits while the southern part is dominantly silty deposits with minor gravel bars and channels. The major soils are classified as Torripsamments, Haplocambids, Haplocalcids and Torriorthents. These are mostly coarse-silty with sandy family modifiers. The dominant potential natural vegetation of these grasslands is bluebunch wheatgrass and needle and thread indicating hot and dry conditions. Soil moisture stress deficits limit forest communities.

Compiled By: Natural Resources Conservation Service

342Ib Yakima Folds

Location: This subsection is located in the Columbia River drainage in central Washington.

Subsection Concept: This subsection consists of a folded and tilted plateau of Columbia River basalts. The major general vegetative type is grassland. This map unit is separated from similar subsections because of the geologic structure.

Subsection Setting and General Characteristics: This tilted plateau plunges to the southeast and has an elevation range of 300 to 4000 feet (91 to 1219 meters). The dominant slope range is 10 to 30 percent. The dominant type of rock is highly fractured basalt which is interbedded with fluvial and lacustrine sediments. The primary geomorphic processes in these landscapes are aeolian, colluvial and residual. Aeolian processes have deposited loess over some areas, while other portions of the unit have formed by in-place weathering or gravitational deposition of basalt.

Mean annual precipitation ranges from 8 inches (20 cms) at lower elevations to 15 inches (38 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 46 to 52 degrees F (7 to 11 degrees C).

Surface water seeps into the fractured basalts and surfaces as seeps along interbeds.

The primary natural disturbance process is wind. Human-caused disturbances include grazing and non-irrigated agriculture. Wind erosion can occur associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the plateau:

The plateau is located on low to mid-elevation sites. The landscape includes the tilted plateau and dissected sideslopes and has formed in aeolian, residual and colluvial deposits over basalt. The primary soils are very shallow to very deep. The northern portion of this unit is dominated by shallow soils formed in residuum with a relatively high amount of clay. These are classified as fine and fine-loamy Lithic, Aridic Argixerolls, Palixerolls and Camborthids dominate. In the southern portion of this unit, soils are moderately deep to very deep and formed in loess. These soils are classified as Aridic, Typic, Calcic Argixerolls and Haploxerolls dominate. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, Cusick bluegrass, Wyoming big sagebrush, antelope bitterbrush and common snowberry.

Compiled By: Natural Resources Conservation Service

342Ic Ritzville Hills

Location: This subsection is located in the Columbia Plateau of southcentral Washington and northcentral Oregon.

Subsection Concept: This subsection consists of gently rolling loess hills on a southwest dipping plateau composed of Columbia River basalts. The major general vegetative type is grassland. This map unit is separated from similar subsections based upon lower precipitation and less relief from the adjacent Blue Mountain Loess Foothills Subsection and silty textures and more relief from the adjacent Richland Lake Basin Subsection.

Subsection Setting and General Characteristics: These gently rolling, loess covered hills have an elevation range of 500 to 2500 feet (152 to 762 meters). The dominant slope range is 0 to 30 percent. Drainageways have slope gradients of 0 to 3 percent. The dominant type of rock is basalt. The primary geomorphic processes in these landscapes are aeolian and fluvial. Windblown loess has been deposited over basalt with subsequent stream downcutting into the loess.

Mean annual precipitation ranges from 9 inches (23 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is primarily in the form of spring and fall rains with a mixture of rain and snow in the winter. The mean annual air temperature is 49 to 54 degrees F (9 to 12 degrees C).

There are a few weakly dissected drainages with a few coulees from the Missoula flood. There are few rivers, streams, lakes and reservoirs. Wetlands and riparian areas are limited to drainageways.

The primary natural disturbance process is fire. Human-caused disturbances include non-irrigated agriculture and limited livestock grazing. Wind and water erosion are associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the loess mantled, rolling hills.

The hills are located on low elevation sites with dominant slope gradients of 0 to 30 percent. These landscapes include the rolling hills and associated drainageways. The primary soils are moderately deep to very deep to bedrock. The surface is typically silt loam with a lime enriched silt loam subsoil. The soil moisture regimes are aridic and xeric having precipitation above 12 inches. The soil temperature regime is mesic. The soils on the loess mantled hills consist of Calcic Haploxerolls, Cambic Durixerolls, Aridic Argixerolls, Lithic Haploxerolls, Typic Haploxerolls, Calcic Haploxerolls, Calcic Argixerolls and Haplic Durixerolls. A minor amount of the area is occupied by narrow floodplains. Flooding is rare to occasional. The soils consist of Cumulic Haploxerolls and Torrifluventic Haploxerolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Sandberg bluegrass and Idaho fescue on the rolling hills, and basin wildrye and basin big sagebrush on the narrow flood plains.

Compiled By: Thor Thorson, Natural Resources Conservation Service

342Id Dry Falls Basalt Scablands

Location: This subsection is located in the Columbia Basin of central Washington.

Subsection Concept: This subsection consists of a generally flat lying, basalt plateau which has been scoured by water from Glacial Lake Missoula floods. The major general vegetative type is grassland. This map unit is separated from similar subsections because the flood removed most of the deep covering of loess which once covered the area.

Subsection Setting and General Characteristics: The plateau has an elevation range of 500 to 2500 feet (152 to 762 meters). The dominant slope range is 0 to 20 percent. The dominant type of rock is basalt. The primary geomorphic processes in these landscapes are fluvial associated with flood waters from Glacial Lake Missoula, and aeolian associated with loess deposits.

Mean annual precipitation ranges from 9 inches (23 cms) at lower elevations to 20 inches (50 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 48 to 52 degrees F (8 to 11 degrees C).

The few rivers and streams are weakly to moderately incised. Reservoirs and pothole lakes (flood-plucked basalt depressions) are numerous throughout this unit.

The primary natural disturbance process was probably wind. Human-caused disturbances include grazing and non-irrigated agriculture. Wind and water erosion can occur associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the plateau:

The plateau is located on low elevation sites. These landscapes include the generally flat lying plateau and some marginally deep coulees. These landforms have formed in thin loess and fluvial deposits over basalt. The primary soils are very shallow to moderately deep, with few areas of very deep soils over basalt formed in loess and flood sands and gravels. The major soils are classified as Lithic, Aridic, Typic; Haploxerolls, Argixerolls and Camborthids. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, Thurber needlegrass and Wyoming big sagebrush.

Compiled By: Natural Resources Conservation Service

342Ie John Day-Deschutes Canyons

Location: This subsection is located in north-central Oregon and corresponds with the east and west county boundaries of Sherman County

Subsection Concept: This subsection consists of the very steep incised canyons of the lower John Day and lower Deschutes Rivers. These canyons are downcut in basalt. The major general vegetative type is grassland. This map unit is separated from the adjacent Ritzville Loess Subsection based on steepness of the topography between the two subsections.

Subsection Setting and General Characteristics: The steep canyon sideslopes extend from the summit of the nearly level Columbia Plateau, down to the river. They have an elevation range of 1000 to 2500 feet (305 to 762 meters). The dominant slope range is 35 to 80 percent. The dominant geologic formations are the Columbia River basalt and the Deschutes Formations. The primary geomorphic processes in these landscapes are water erosional and gravitational. The down cutting of the John Day and Deschutes Rivers is continuing to develop the landscape.

Mean annual precipitation ranges from 9 inches (23 cms) at lower elevations to 12 inches (30 cms) at higher elevations. Precipitation is mostly in the form of spring and fall rains with occasional snowfall. The mean annual air temperature is 45 to 52 degrees F (7 to 11 degrees C).

The main surface water in the area is the John Day and Deschutes Rivers. There are numerous intermittent drainageways on the canyon sideslopes.

The primary natural disturbance process is fire. Human-caused disturbances include livestock grazing and recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the very steep canyon sideslopes. Included are the narrow riparian areas along the John Day and Deschutes Rivers.

The canyons are located at low to mid-elevation sites with dominant slope gradients of 35 to 80 percent. This landscape consists of colluvial sideslopes that have formed in basalt, tuff and andesite. The soil moisture regime is aridic and the soil temperature regime is mesic. The primary soils are shallow and moderately deep to bedrock. The surface is typically very stony loam with a very cobbly loam subsoil. Basalt rock outcrop occurs at the higher elevations. Welded tuffs and various stratas of the Deschutes Formation are exposed at the lower elevations. The major soils on the south facing slopes are classified as Lithic Haploxerolls. On north facing slopes the major soils are classified as Lithic Haploxerolls and Pachic Haploxerolls. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and Wyoming big sagebrush. Idaho fescue dominates on north slopes and bluebunch wheatgrass on south slopes.

Compiled By: Thor Thorson, Natural Resources Conservation Service

342If Mansfield Glaciated Basalt Plateau

Location: This subsection is located in the Columbia Basin of Washington.

Subsection Concept: This subsection consists of a basalt plateau which was glaciated by the continental ice sheet. The major general vegetative type is grassland. This map unit is separated from similar subsections because of the different landforms and materials deposited by the the glaciation.

Subsection Setting and General Characteristics: This glaciated plateau has an elevation range of 2000 to 3000 feet (610 to 914 meters). The Columbia River dissects this unit with low elevations of 950 feet (290 meters). The dominant slope range is 0 to 30 percent, but it ranges to 60 percent along the sideslopes of dissected drainages. The dominant type of rock is basalt with some isolated areas of granite. The primary geomorphic processes in these landscapes are glaciation, fluvial and aeolian. The glaciation produced deposits of basal till, outwash and glaciolacustrine materials. The Columbia River gorge cuts through the middle of the section and aeolian processes deposited loess and volcanic ash over much of the area.

Mean annual precipitation ranges from 10 inches (25 cms) at lower elevations to 13 inches (33 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 47 to 52 degrees F (8 to 11 degrees C).

The Columbia River gorge dissects this subsection. Foster Creek is the major perennial drainage. The majority of the area has poorly defined drainages with numerous potholes, intermittent lakes and wetlands. Wetlands are very common on the till plain and occur in potholes and intermittent lakes. During periods of drought, dry intermittent lakes are exposed with saline-sodic silty lacustrine deposits.

The primary natural disturbance process is probably wind. Human-caused disturbances include grazing and non-irrigated agriculture. Wind and water erosion can occur associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the plateau.

This plateau is located on low to mid-elevation sites. The landscape includes till plains, outwash channels and terraces, eskers, kames and kettle potholes associated with the glaciation, and gorges, steep cliffs and bluffs associated with the Columbia River. This plateau has been modified by glacial, fluvial and aeolian processes. The dominant bedrock is basalt. Tephra from Glacier Peak are a major component in the upper part of the soils. Pumice greater than 2 mm are generally restricted to the western portion of the area. Volcanic glass content of 20 to 50 percent are common. Soils on till plains and outwash terraces are Vitrixerandic Haploxerolls and Durixerolls. Soils on eskers and kames are Typic and Vitrixerandic Haploxerolls and Haploorthents. Soils formed in lacustrine materials are Haploxerolls and Durixerolls. The eastern edge near Nelson Butte has been scoured by overwash of Missoula flood surges into Glacial Lake Columbia. Lithic Argixerolls and Haploxerolls are common. The dominant potential natural vegetation is Wyoming sagebrush and bluebunch wheatgrass in the southern part of the subsection and below 2300 feet. Threetip sagebrush and Idaho fescue occur in the northern portion of this unit and in areas above 2300 feet in elevation.

Compiled By: Natural Resources Conservation Service

342Ig Cheney Basalt Scablands

Location: This subsection is located in the eastern portion of the Columbia Basin in Washington.

Subsection Concept: This subsection consists of a flat lying basalt plateau which has been scoured by flood water from Glacial Lake Missoula. This scouring has resulted in a vegetative pattern of forests in areas of deeper soils with grassland on the shallower soils which resulted from the scouring. This map unit is separated from similar subsections because of the vegetative pattern produced by the flooding.

Subsection Setting and General Characteristics: The generally flat lying basalt plateau has an elevation range of 1500 to 2500 feet (457 to 762 meters). The dominant slope range is 0 to 20 percent. The dominant type of rock is basalt. The primary geomorphic processes in these landscapes are fluvial associated with flood waters from Glacial Lake Missoula and aeolian associated with loess deposits.

Mean annual precipitation ranges from 15 inches (38 cms) at lower elevations to 20 inches (50 cms) at higher elevations. Precipitation is in the form of rain in the spring and fall and snow in the winter. The mean annual air temperature is 47 to 52 degrees F (8 to 11 degrees C).

A few rivers and streams occur in weakly to moderately incised flood coulees. Pothole lakes (flood-plucked basalt depressions) are numerous throughout this subsection.

The primary natural disturbance processes are wind and geologic flooding. Human-caused disturbances include grazing and non-irrigated agriculture. Wind and water erosion can occur associated with dryland farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the flood scoured plateau:

The plateau is located on low to mid-elevation sites. The landscape includes the flood scoured plateau, some moderately deep coulees, some pattern ground (mima mounds), and escarpments of basalt at margins of coulees with terraces of fluvial deposits along the bottoms of the coulees. These landforms have formed in thin loess and fluvial deposits over basalt. The primary soils are very shallow to moderately deep on pattern ground, with a few areas of very deep soils over basalt formed in coulees. These soils are classified as Lithic and Typic Haploxerolls and Argixerolls. The dominant potential natural vegetation consists of ponderosa pine and Idaho fescue on the moderately deep to very deep soils. Sandberg bluegrass and bluebunch wheatgrass also occur.

Compiled By: Natural Resources Conservation Service

M242Ca Wenatchee Highlands

Location: This subsection is located in the state of Washington State in the upper portions of the Wenatchee, Entiat and Chelan subbasins.

Subsection Concept: This subsection consists of highlands along the eastern crest of the Cascade Mountains. They are composed of igneous and metamorphic rock which have been altered by alpine glaciation. The major vegetative type is coniferous forest influenced by maritime climatic conditions. This map unit is separated from adjacent units because of less expression of glaciation, geologic materials, or potential natural vegetation reflecting drier climatic conditions.

Subsection Setting and Ecological Relationships: These highlands have an elevation range of 2500 to 9500 feet (762 to 2896 meters). The side slopes have straight to concave shapes, upper slopes are steep (60 to 90 percent) with excessive rock outcrop. Lower slope gradients range from 30 to 60 percent and are mantled with glacial drift and colluvium. Local relief from ridge tops to valley bottoms ranges from 1000 to 2000 feet (305 to 610 meters). The dominant types of bedrock is igneous and metamorphic. Igneous rocks are primarily tonalite and granodiorite. Metamorphic rocks are predominantly gneiss and schists. The primary geomorphic process is alpine glaciation which carved out and over steepened slopes to form broad U shape trough valleys.

Mean annual precipitation ranges from 50 to 160 inches (125 to 400 cm). Most of the precipitation comes in the winter as snow. The mean annual air temperature is 38 to 43 degrees F (3 to 6 degrees C).

Stream drainage features are characterized by U shaped valleys with parallel patterns of incised, low-order (class 4 & 5) tributary streams. Tributary drainage density is 15 to 25 streams per mile. Upper ridges receive tremendous snow packs but are unable to regulate runoff which causes flashy spring stream flows. Near surface ground water, seeps, and springs on lower slopes helps to maintain base flows and low stream temperatures. Wet meadows in valley bottom positions are common. Higher order streams and rivers have braided to meandering patterns.

The primary natural disturbance processes are debris slides and fire. Rain-on-snow and other unusual runoff events can trigger debris failures which often originate from the incised low-order tributaries. These failures deliver coarse sediment and large woody debris to higher order streams. Natural fire frequency ranges from 100 to 300 years for high intensity stand replacing fires. Large fires can drastically increase debris slides. Human-caused disturbances are associated with road building and timber harvest. Roading can divert near surface ground water on lower slopes creating surface erosion concerns and timber harvest can increase debris hazards.

Subsection Components:

This subsection consists of three primary landscape setting. These include glacial cirques and peaks, glacial trough walls, and trough bottoms.

The glacial cirques and associated scoured peaks and ridges occur in upper elevations. Slopes are gentle in cirque basins but exceed 60 percent in other locations. These landscapes include cirque headwalls, cirque basins, and scoured peaks formed in hard bedrock. These landscapes are dominated by rock outcrop and talus cones. Where soils do occur they are shallow with mantles of volcanic ash and pumice. Soils are influenced by cold moist environments and are classified as Lithic and Andic Cryumbrepts. The dominant potential natural vegetation is influenced by maritime climatic conditions and typically consists of alpine meadows associated with and mountain hemlock.

The trough walls range from low to high elevations with dominate slopes ranging from 30 to 60 percent. These landscapes include the trough walls and lateral glacial moraines. Avalanche chutes are common in these locations. Typically the south facing slopes have more than 25 percent bedrock exposures and thin mantles of volcanic ash and glacial till. North facing slopes however, typically have less than 25 percent bedrock exposures and thicker deposits of volcanic ash and glacial till. Soils are influenced by cold moist environments, volcanic ash and pumice, and cobbly glacial till deposits. The major soils are deep with sandy loam surfaces with cobbly subsoils and are classified as Haplo and Typic Cryorthods. The dominant potential natural vegetation is influenced by maritime climatic conditions and consists of mountain hemlock and silver fir series.

The trough bottoms form the low elevation U shaped valleys and lower slopes of the glacial troughs. Dominant slope gradients are less than 30 percent. These landscapes include glacial moraines, stream terraces, alluvial fans, and glacial-fluvial flood plains. Soils are influenced by cold moist environments, seasonally high water tables, volcanic ash, and cobbly regolith materials. The major soils are deep with sandy loam surfaces, gravelly or cobbly subsoils, and are classified as Typic and Humic Cryorthods and Cryofluvents. The dominant potential natural vegetation is influenced by maritime climatic conditions and consists of pacific silver fir, western hemlock series, and some wet meadows.

Compiled by: Carl Davis, Claudia Narcisco, and Terry Lillybridge Wenatchee NF

M242Cb Chelan and Sawtooth Highlands

Location: This subsection is located in northcentral Washington. The unit is located in the upper Chelan subbasin and the upper elevations of the Methow basin.

Subsection Concept: This subsection consists of mountains along the eastern crest of the Cascade Mountains. The unit is composed of metamorphic and intrusive rocks which have been modified by glacial and fluvial processes. The major vegetation is coniferous forest influenced by continental climatic conditions. This map unit is separated from adjacent units because of less expression of glaciation, geologic materials, and/or potential natural vegetation series that reflect moist climatic conditions.

Subsection Setting and Ecological Relationships: These mountains have an elevation range of 1100 to 8000 feet (335 to 2439 meters). The side slopes have straight to concave shapes, upper slopes are steep (60-90 percent) with excessive rock outcrop. Lower slopes range from 30 to 60 percent and have pockets of glacial drift associated with rocky knobs. Local relief from ridge tops to valley bottoms ranges from 1000 to 2000 feet (305 to 610 meters). Toe slopes of the Chelan and Entiat troughs have been truncated by large valley glaciers. The dominant types of rocks are diorite, tonalite, gneiss, schist and amphibolite. The primary geomorphic processes have been alpine glaciation and fluvial erosion on the margin of continental glaciation. The glacial processes have carved out and over steepened slopes to form broad U shape trough valleys.

Mean annual precipitation ranges from 15 to 55 inches (38 to 138 cms). Most of the precipitation comes in the winter as snow. The mean annual air temperature is 42 to 45 degrees F (6 to 7 degrees C).

Stream drainage features are characterized by U shaped valleys with parallel patterns of incised low-order (class 4) tributary streams flowing into higher order (class 2 and 3 streams). Tributary drainage density ranges from 10 to 15 streams per mile. Flashy runoff regimes are common in the spring. Late summer stream flows are usually low or intermittent. Seeps and springs have low flow and are not common. Class 3 streams are deeply entrenched forming V shaped inter-gorges.

The primary natural disturbance process is fire and debris slides. Natural fire frequency range from 10 to over 100 years. In lower elevations, frequencies range from 10 to 20 years and are low intensity. While in upper elevations, fire frequencies typically range from 50 to 100 years and are high intensity stand replacing fires. Following high intensity fires, small debris slides and gully development usually occurs in incised drainage ways. High intensity storms can cause flashy run off which can trigger debris slides, stream channel scouring, and seasonal flooding. Human-caused disturbances are associated with livestock grazing, fire suppression, and timber harvest.

Subsection Components:

This subsection consists of three primary landscape settings. These include glacial cirques and peaks, glacial trough walls, and trough bottoms.

The glacial cirques and peaks and associated scoured peaks and ridges occur on upper elevations above 6500 feet (1982). Slopes are gentle in cirque basins but exceed 60 percent in other locations. These landscapes include cirque headwalls, cirque basins, and scoured peaks formed in hard bedrock. These landscapes are dominated by rock outcrop and talus cones. Where soils do occur they are shallow with mantles of volcanic ash and pumice. Soils have been influenced by cold dry environments, volcanic ash, and coarse texture regolith features. The major soils are moderately shallow with fine sandy loam "ashy" surfaces, with gravelly and cobbly subsoils, and are classified as Typic Vitricryands, Typic Cryorthods, and Typic or Lithic Cryochrepts. The

potential natural vegetation patterns are influenced by cold continental climatic conditions and consists of alpine meadows, associated with subalpine larch, whitebark pine, and subalpine fir.

The glacial trough walls have straight to concave shaped ridges and occur from 1100 to 6500 feet (335-1982 meters). The dominant slope gradients range from 30 to 90 percent. These landscapes include trough walls, lateral glacial moraines, dissected mountain ridges, and truncated toe slopes. Debris and snow avalanche chutes can be common. Soils are influenced by dry environments, mantles of volcanic ash/pumice, and coarse textured regoliths. The major soils are moderately deep with fine textured "ashy" surfaces, coarse textured gravelly or cobbly subsoils, which are classified as Typic Vitrandepts and Xeric Vitricryands associated with rocky knobs. The potential natural vegetation patterns are influenced by relatively dry, continental climatic conditions. Soil moisture deficits limit forest patterns in lower elevations. The potential natural vegetation consists of Douglas-fir, grand fir, and subalpine fir series in the upper elevations and open Ponderosa pine series and grassland shrub steppe communities in the lower elevations.

The trough bottoms form the U shaped low elevation valleys and lower slopes of the glacial troughs. Lake Chelan fills the Chelan trough. The other trough bottoms have dominant slopes ranging less than 30 percent. These landscapes include glacial moraines, stream terraces, alluvial fans, and glacial fluvial flood plains. Soils are influenced by dry warm environments, veneers of volcanic ash or pumice, and cobbly subsoils. The primary soils are deep with fine sandy loam "ashy" surfaces and gravelly or cobbly subsoils. The primary soils are classified as Andic Xerochrepts and Xeric Vitrandepts. The dominant potential natural vegetation is influenced by warm dry continental climatic conditions and consists of Douglas-fir and ponderosa pine series associated with grassland shrub steppe communities.

Compiled by: Carl Davis, Claudia Narcisco, and Terry Lillybridge Wenatchee NF and Kenneth Radek of the Okanogan NF

M242Cc Cascade Mountains

Location: This subsection is located on the eastern slope of the Cascade Mountains. It extends from just north of Ellensburg, Washington south to Bend, Oregon.

Subsection Concept: This subsection consists of lower elevation plateaus and mountains on the eastern slope of the Cascades that were not glaciated. These landscapes are underlain by a mix of igneous extrusive materials. The major vegetation is coniferous forests influenced by dry continental climatic conditions. This map unit is separated from similar units based upon more expression of glaciation, geologic material, and potential natural vegetation that is reflecting more moist climatic conditions, and geology.

Subsection Setting and Ecological Relationships: These mountain slopes have a dominant elevation range of 2000 to 6000 feet (610 to 1829 meters). However, elevation extremes range from 300 feet (91 meters) along the Columbia River near Hood River, Oregon to over 7,000 feet (2134 meters) on isolated buttes. The dominant slope range is 0 to 50 percent. The dominant types of geological materials are variable. Fine grained dark gray basalt flows of the Grande Ronde and Columbia River Basalt Group predominate interbedded with weakly cemented sedimentary and pyroclastic deposits. Locally some andesite, dacite and rhyolite occurs. The primary geomorphic processes is fluvial downcutting and mass wasting.

Mean annual precipitation generally ranges from 10 inches (25 cms) at lower elevations to 50 inches (125 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is generally 40 to 47 degrees F (4 to 10 degrees C) but ranges to 51 degrees F (11 degrees C) near the Columbia River. Cyclic drought conditions can occur in lower elevations.

Stream drainage features are characterized by widely spaced parallel to dendritic higher order streams (class 1-3). Tributary streams are normally weakly incised, low-order (class 4), with drainage densities ranging from two to five per mile. In some locations, surface water seeps into the geologic material and surfaces as seeps and springs along flow escarpments or lower slopes. Deep ground water reservoirs can be present. Stream flows within the unit are unusually low in comparison to size of watersheds.

The primary natural disturbance processes are fire, drought, and mass wasting. The natural fire frequency ranges from 10 to 100 years. At lower elevations, fire frequencies typically range from 10 to 15 years and are predominately low intensity. While in upper elevations, fire frequencies ranges from 50 to 100 years for high intensity fires. Drought conditions can be cyclic in lower elevations. Seeps and springs along flow escarpments can be associated with debris flows, earth flows, and deep seated landslides. Human-caused disturbances are associated with timber harvesting and livestock grazing, with fruit orchards occurring along the Columbia River portion of this unit.

Subsection Components:

This subsection consists of one primary landscape component, plateaus and mountain slopes.

These plateaus and mountain slopes are located on low to mid-elevation sites with dominant slope gradients of 0 to 50 percent. These landscapes include plateaus, volcanic buttes and cones, flow escarpments. Debris flows, earthflows, and deep seated landslides occur along flow escarpments and side slopes. Glacial outwash plains and alluvial fans occur in valley positions. Soils are influenced by warm dry continental climatic conditions, mantles of volcanic ash, and gravelly regoliths. The major soils are moderately deep or deep with sandy loam surfaces and gravelly subsoils. The dominant soils are classified as Vitrixerands, Haploxerolls, Xerumbrepts and Hapoxeralfs dominate

the landscape. In higher elevations Vitricryands. In lower elevations, Haploxeralfs, Argixerolls, and Vitrixerands dominate. The dominant potential natural vegetation patterns are influenced by dry continental climatic conditions. Soil moisture deficits limit forest patterns on southern exposures and lower elevations. The potential natural vegetation consists of grand fir, Douglas-fir, and subalpine series in the upper elevations. Ponderosa pine series are associated with grassland shrub steppe communities in the mid and low elevations. At the lowest elevations in the Naches drainage and along the Columbia River, Oregon white oak, big leaf maple and tall Oregon grape are associated with grassland communities.

Compiled By: Thor Thorson, Natural Resources Conservation Service, and Larry Chitwood, Joe Bailey, Carl Davis, and Claudi Narcisco U. S. Forest Service

M242Cd Lapine Pumice Flats

Location: This subsection is located in south-central Oregon in the Lapine and Sun River area.

Subsection Concept: This subsection consists of lava plains and buttes mantled with coarse sand-sized ash and pumice from Mount Mazama. They are underlain by a mix of igneous extrusive rocks, primarily basalt. The major general vegetation type is forest. This map unit is separated from similar subsections based upon the nearly level to gently sloping topography and the deposition of the coarse and very coarse sand-sized ash mixed with pumice.

Subsection Setting and General Characteristics: These plains and buttes have a dominant elevation range of 4000 to 6000 feet (1219 to 1829 meters). The dominant slope range is 1 to 15 percent with a significant area being from 1 to 5 percent. The dominant types of geological materials are basaltic and andesitic lava, tephra and tuffs overlain by a thick mantle of ash and pumice. The primary geomorphic processes in these landscapes are associated with the volcanic activity. Recently formed cinder cones have been subjected to aeolian and fluvial processes.

Mean annual precipitation generally ranges from 18 inches (45 cms) at lower elevations to 40 inches (100 cms) at higher elevations. Precipitation is generally in the form of snow. The mean annual air temperature is generally 40 to 45 degrees F (4 to 7 degrees C).

There are very few streams and very little surface water. Infiltration and hydraulic conductivity rates are very high except for periods of frozen ground.

The primary natural disturbance process is fire. The main human-caused disturbances are associated with timber harvesting and fire suppression. Mountain pine beetle infestations are major disturbances during times of drought.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the ash and pumice mantled lava plains.

The plains are located on mid-elevation sites with dominant slope gradients of 1 to 15 percent. This landscape is geologically recent being formed about 6700 years ago when Mt. Mazama erupted. The short amount of time since the volcanic activity and the limited precipitation result in limited landscape development. These areas include some cinder cones and steep fault scarps having slopes up to 30 percent. The soil moisture regime is xeric and the soil temperature regime is cryic. The unique thermal properties of pumice reflect the cold temperatures. The primary soils are very deep to deep to bedrock. A buried soil is typically present at depths of 30 to over 60 inches. The ash deposited material is typically gravelly loamy coarse sand throughout the profile. The buried soil, when present, is typically loam. Soil nutrients are primarily contained in the surface layer organic matter. The soils are classified as Xeric Vitricryands, Aquic Vitricryands and Typic Cryaquands. The unique thermal properties of pumice reflect the cold temperature. The soils have a higher than expected water holding capacity because of the ashy and pumiceous soil material. The dominant potential natural vegetation consists of lodgepole pine, ponderosa pine, antelope bitterbrush and Idaho fescue.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Larry Chitwood, Deschutes National Forest

M242Ce Glaciated Cascade Mountains

Location: This subsection is located on crest of the central and northern Cascade Mountains in Oregon

Subsection Concept: This subsection consists of the upper elevations of the east flank of the high Cascades that have been glaciated. The mountain slopes are underlain by a mix of igneous extrusive rocks. The major general vegetation type is forest. This map unit is separated from similar subsections based upon vegetation and parent material. The adjacent Cascade Mountains, Non-glaciated subsection is at lower elevations, lacks the glacial landforms and is dominated by ponderosa pine and white fir.

Subsection Setting and General Characteristics: The crest of the Cascades has a dominant elevation range of 4500 to 8000 feet (1372 to 2438 meters) with extremes of 3000 to 11,000 feet (914 to 3353 meters). The dominant slope range is 5 to 80 percent. The dominant types of geological materials are andesite with some dacite and rhyolite. The primary geomorphic processes in these landscapes are associated with glaciation and mass wasting. Recent volcanic activity and young glacial features are only beginning to stabilize. Large debris flows are common and earth flows may cover several square miles.

Mean annual precipitation generally ranges from 70 inches (175 cms) at lower elevations to 120 inches (300 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 38 to 45 degrees F (3 to 7 degrees C).

There are poor to well developed drainages. This is a major ground water recharge area.

The primary natural disturbance processes are glaciation and mass wasting. The human-caused disturbances are associated with timber harvesting and recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the crest of the central and northern Cascade Mountains in Oregon.

The glaciated mountain slopes are located on mid to high elevation sites with dominant slope gradients of 5 to 80 percent. These landscapes include generally steep slopes with some small and large cones and rolling uplands modified by glacial activity. Numerous volcanic peaks occur throughout the unit. These landscapes have formed in material weathered from andesite, dacite and rhyolite. The soil moisture regime is udic and the soil temperature regime is cryic. The primary soils are very deep and well drained. The surface texture is primarily stony fine sandy loam with a very cobbly fine sandy loam or loam subsoil. Andic Haplocryods, Typic Fulvicryands and Vitrandic Cryochrepts dominate the landscape. The dominant potential natural vegetation consists of mountain hemlock, lodgepole pine, white fir, subalpine fir, larch and vine maple.

Compiled By: Thor Thorson, Natural Resources Conservation Service, and Larry Chitwood and Joe Bailey, U.S. Forest Service

M242Cf Newberry Volcano

Location: This subsection is located in central Oregon, southeast of Bend, Oregon in the vicinity of Newberry Crater.

Subsection Concept: This subsection is characterized by a large shield volcano that rises from a gently rolling lava plateau that is interrupted by many cinder cones. Thick air-fall deposits of pumice and ash blanket the rolling lava plain; thinning downwind to the northeast. The subsection is mostly forested.

Setting and General Characteristics: This subsection occurs on a gently rolling lava plateau that ranges in elevation from 4,000 to 5,500 feet (1219 to 1676 meters). Slope gradient ranges from 5 to 30 percent. A large volcanic mountain rises to 8,000 feet (2438 meters) elevation and more than 200 cinder cones, dot the lava plain landscape. The mountain slopes and cinder cones have gradients of 30 to 90 percent. Most of the area is covered by basalt lava flows of Pleistocene and Holocene age that is blanketed by pumice and volcanic ash. Although volcanism is the dominant geomorphic process, local glaciation occurred on Newberry Volcano as evidenced by glacio-fluvial material on it's eastern flank; fluvial and eolian processes have redistributed the air fall surface deposits in the landscape.

Mean annual precipitation ranges from about 20 to 50 inches (50 to 125 cm) occurring mostly as snow during winter. The mean annual air temperature ranges from 35 to 45 degrees F (2 to 7 degrees C). One surface stream, Paulina Creek flows from the area; two high-elevation lakes are located in the Newberry caldera. Natural disturbance has been from fire, drought and insect outbreaks. Suppression of fires by humans has resulted in timber stand replacement fires. Timber harvest and grazing of domestic livestock have resulted in compaction, erosion and displacement of the soils.

Major Ecological Components and Their Characteristics: This subsection consists of: 1) a lava plain, 2) a volcanic mountain, and 3) numerous cinder cones.

The volcanic mountain component is the Newberry volcano with elevation from 5,400 to 8,000 feet (1646 to 2438 meters) and slope gradients ranging from 30 to 90 percent. The soil temperature regime is cryic and the soil moisture regime xeric, except for a small area of udic moisture regime, mostly on north slopes and above 6,500 feet (1981 meters) elevation. Representative soils include Xeric Vitricryands and Entic Cryorthods developed in the mantle of ash and pumice of varying thickness. The potential natural vegetation is dominated by lodgepole pine and mountain hemlock in the overstory with huckleberry, snowbrush and pinemat manzanita common in the understory.

The lava plain is located throughout the subsection, surrounding the volcanic mountain. It ranges in elevation from 4,000 to 5,500 feet (1219 to 1676 meters) and has slope gradients that range from 5 to 30 percent. The soil moisture regime is xeric and the soil temperature regime is cryic. The unique thermal properties of pumice reflect the cold temperatures. The primary soils are very deep to deep to bedrock. A buried soil is typically present at depths of 30 to over 60 inches (75 to 150 cms). The ash and pumice material is typically gravelly loamy coarse sand throughout the profile. The buried soil, when present, is typically loam. Soil nutrients are primarily contained in the surface layer organic matter. The soils are classified as Xeric Vitricryands, Aquic Vitricryands and Typic Cryaquands. The soils have a higher than expected water holding capacity because of the ashy and pumiceous soil material. Included are areas of shallow soils, Lithic Vitricryands, and exposed lava bedrock. The dominant potential natural vegetation consists of lodgepole pine, ponderosa pine, antelope bitterbrush and Idaho fescue.

The cinder cones are scattered across the lava plain throughout the subsection. They protrude 50 to 500 feet from the plateau surface and have

slope gradients that range from 30 to 50 percent. Soil moisture regime is xeric and soil temperature regime is cryic. Representative soils are classified as Xeric Vitricryands with many cinder fragments. Soils are warmer and drier during summer months on south slopes than on north slopes; associated with potential natural vegetation dominated by ponderosa pine, bitterbrush and manzanita on south slopes, and white fir and ponderosa pine with snowbrush and manzanita on north slopes.

Compiled by: Duane Lammers, U. S. Forest Service

M242Cg Oregon High Cascades

Location: This subsection is located on the east flank and crest of the southern Cascade Mountains in Oregon

Subsection Concept: This subsection consists of the east flank and upper elevations of the high Cascades that have been glaciated. These areas are underlain by a mix of igneous extrusive rocks and have been buried under a deposit of pumice and ash from Mount Mazama. The major general vegetation type is forest. This map unit is separated from similar subsections based upon parent material and vegetation. The adjacent Oregon Cascades, Glaciated subsection lacks the pumice and ash deposits from Mt. Mazama. The Lapine Pumice Flats subsection is dominated by lodgepole pine and ponderosa pine and has a xeric soil moisture regime.

Subsection Setting and General Characteristics: The east flank of the Cascades has a dominant elevation range of 5000 to 8000 feet (1524 to 2438 meters) with extremes of 4000 to 9,000 feet (1219 to 2743 meters). The dominant slope range is 5 to 40 percent. The dominant types of geological materials are andesite with some dacite and rhyolite. The primary geomorphic processes in these landscapes are volcanic and aeolian with pumice and ash being deposited over much of the landscape. The pumice is highly erodible and has been eroded from some steep slopes and mountain peaks. The thick pumice deposits capture most moisture.

Mean annual precipitation generally ranges from 40 inches (100 cms) at lower elevations to 75 inches (188 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 38 to 45 degrees F (3 to 7 degrees C).

There are very few streams or rivers. The soils have extremely high infiltration and percolation rates except during periods of frozen ground.

The primary natural disturbance process is aeolian deposition associated with volcanism. The main human-caused disturbances are associated with timber harvesting and recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the crest of the southern Oregon Cascades.

These glaciated areas are located on high elevation sites with dominant slope gradients of 5 to 40 percent. These landscapes include some small and large cones and rolling uplands modified by glacial activity. These landscapes have formed in thick deposits of pumice and ash over andesite with some dacite and rhyolite. The soil moisture regime is udic and the soil temperature regime is cryic. The primary soils are very deep and somewhat excessively drained. The surface layer is typically gravelly loamy sand with a very gravelly loamy coarse sand substratum. A buried soil is present at a depth of 40 to over 60 inches. Andic Haplocryods, Thaptic Vitricryands and Typic Vitricrands dominate the landscape. The dominant potential natural vegetation consists of mountain hemlock, lodgepole pine, white fir, subalpine fir, larch and vine maple.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Larry Chitwood, Deschutes National Forest

M242Ci Cle Elum/Lake Wenatchee Mountain Valleys

Location: This subsection is located in the state of Washington in the Wenatchee and Upper Yakima subbasins.

Subsection Concept: This subsection consists of large inter-mountain valleys along the eastern slope of the Cascade Mountains. These valleys have thick deposits of glacial and glacial fluvial deposits that mantle sedimentary rock. The major vegetation is coniferous forests. Climatic conditions are transitional from maritime to continental. This map unit is separated from adjacent units because of less expression of glacial erosion, absence of glacial till deposits, and the presence of igneous or metamorphic bedrock.

Subsection Setting and Ecological Relationships: These mountain valleys have an elevation range of 1900 to 4200 feet (579 to 1280 meters). Typically micro-relief is very smooth or undulating. Slope shapes are variable depending upon the type of deposition. The Lake Wenatchee Area consists of glacial moraine deposits that have undulating micro-relief, local relief ranges from 50 to 500 feet, convex slope profiles, and slope gradients ranging from 0 to 50 percent. The Cle Elum Area consists of glacial fluvial deposits that have smooth surfaces, concave slope profiles, with little micro-relief, and slope gradients range from 0 to 10 percent. The dominant types of underlying bedrock is sedimentary with lesser amounts of volcanic and metamorphic. Sedimentary rocks are primarily sandstone interbedded with siltstone and shale. The primary geomorphic processes have been glacial and glacial-fluvial deposition.

Mean annual precipitation ranges from 30 to 80 inches (75 to 200 cms). Most precipitation occurs in the winter as snow. The mean annual air temperature is 39 to 45 degrees F (4 to 7 degrees C). Maritime air flow through mountain passes funnels into this unit strongly affecting climatic conditions.

Stream drainage features include ground and end moraines that normally have deranged drainage patterns with runoff collecting in closed depressions. Drainage density ranges from 5 to 10 channels per mile. Stream bottoms contain Class 2 and 3 rivers that have meandering and braided patterns. Near surface groundwater, seeps and springs helps to recharge late summer stream flows and moderate water temperatures. Water tables fluctuate seasonally near the surface in valley positions creating wet meadows. Valley positions are subject to spring flooding.

The primary natural disturbance process are debris slides, seasonal flooding and fire. Rain-on-snow and other unusual runoff events can trigger debris slides and seasonal flooding. These slides deliver coarse sediment and large woody debris to streams. Seasonal flooding scours banks which can contribute sediment and large woody debris to channels. The natural fire frequency ranges from 100 to 300 years for high intensity stand replacing fires. Debris slides usually follow large stand replacing fires. Human-caused disturbances are associated with roading and timber harvesting.

Subsection Components:

This subsection consists of two primary landscape settings. These include glacial moraines and valley bottoms.

The glacial fluvial valley bottoms are located at low to mid elevation sites with dominant slope gradients 0 to 10 percent. These valley bottoms consist of alluvial fans, terraces, glacial-fluvial out wash plains, and flood plains. Soils are influenced by cold moist environments, mantles of volcanic ash and pumice, cobbly glacial fluvial material, or alluvial deposits. The major soils are deep, with fine textured "ashy surfaces and with gravelly or cobbly subsoils. Dominate soils are classified as Typic Cryohumods, Typic Cryorthods, and Andic Cryochrepts. The potential natural vegetation patterns are influenced by climatic conditions that are transitional from maritime to

continental. The potential natural vegetation consists of Douglas-fir, grand fir, western Hemlock, and some wet sedge/willow meadows.

The glacial moraines are located on upper valley sideslopes at mid to high elevation sites, with slope gradients ranging from 10 to 50 percent. These glacial moraines include ground, terminal, and lateral moraines of different thicknesses. Soils are influenced by cold moist environments, mantles of volcanic ash, and coarse textured cobbly regoliths. The major soils have fine sandy loam surfaces, with gravelly or cobbly subsoils, and which are classified as Typic Vitrandepts, Andic Cryochrepts, Cryorthods, Typic Haplorthods. The potential natural vegetation patterns are influenced by climatic conditions that are transitional from maritime to continental. The potential natural vegetation consists of Douglas-fir, grand fir and western hemlock series.

Compiled by: Carl Davis, Claudia Narcisco, Terry Lillybridge Wentachee NF

M242Cm Wenatchee-Swauk Sandstone Hills

Location: This subsection is located in the State of Washington in the lower Wenatchee subbasin.

Subsection Concept: This subsection consists of hills along the eastern slope of the Cascade Mountains. These hills are composed of folded inter-bedded sedimentary rocks that have been modified by fluvial and mass wasting processes. The major vegetation is coniferous forest influenced by continental climatic conditions. This map unit is separated from adjacent units based upon lack of glacial expression, folded bedrock, igneous or metamorphic bedrock, and/or potential natural vegetation that reflects moist climatic conditions.

Subsection Setting and Ecological Relationships: These hills have an elevation range of 1000 to 5000 feet (305 to 1524 meters). Side slope profiles have straight shapes, slopes range from 30 to 60 percent. Local relief from ridge tops to valley bottoms ranges from 500 to 1000 feet (152 to 305 meters). The folded inter-bedded sedimentary rocks are controlling the shape of the land surface. Structural features such as dip and scarp slope complexes are common. The geologic formations are the Chumstick and Swauk which are predominantly sandstone. The sandstone beds are inter-bedded with siltstone, shale, and some conglomerate. Basalt, seated land slides, volcanic and igneous intrusive processes have been mass wasting and fluvial down cutting. Mass wasting processes in the weak incompetent beds created landslides of varying size. Streams eroded these landslides and down cut into weaker rock units forming valleys. The resistant sandstone and conglomerate beds form prominent ridges.

Mean annual precipitation ranges from 15 to 49 inches (38 to 123 cm). The unit falls within a rain shadow on the east side of the Cascade Mountains. Most precipitation occurs in the winter as snow. The mean annual air temperature is 42 to 47 degrees F (6 to 8 degrees C).

Stream drainage features include V shaped valleys with trellis stream patterns. The folded sedimentary bedrock has controlled stream patterns. Tributary drainage density ranges from 5 to 15 per mile. The drainage density, soil regoliths, and topographic relief create high sediment delivery efficiencies for fine sediment. Fine "sandy" alluvial material has filled and widened ephemeral draws and valley bottoms. Stream flows are usually intermittent or perennial streams have interrupted flows.

The primary natural disturbance process is fire and debris slides. The natural fire frequency ranges from five to 100 years depending upon vegetation and elevation. In the lower elevations, frequencies range from five to 10 years and are low intensity. Upper elevations have fire frequencies ranging from 50 to 100 years and are high intensity stand replacing fires. The high intensity fires are followed by small debris slides which occur in drainage ways. High intensity storms have caused flashy run off and stream channel scouring. Human caused disturbances such as historic livestock grazing, fire suppression, and selective timber harvest have all affected fire severity.

Subsection Components:

This subsection consists of one primary landscape setting. This includes dissected sandstone hills.

These dissected sandstone hills are located on low to mid-elevation sites with dominant slope ranges of 30 to 60 percent. These landscapes include a complex of scarp slopes, hogbacks, dip slopes, and earth flows. Soils have been influenced by the cool relatively dry environments, some volcanic ash, and weathered inter-bedded bedrock with varying textural properties. The major soils are moderately deep with fine sandy loam surfaces and variable textured regoliths depending upon bedrock. The major soils are classified as Andic

and Dystric Xerochrepts and Ultic Haploxeralfs. The potential natural vegetation is influenced by a rain shadow affect creating dry continental climatic conditions. Soil moisture deficits limit forest patterns at lower elevations. Dominant natural vegetation is transitional from ponderosa pine series associated with grassland shrub-steppe communities in low elevations to Douglas-fir and grand fir series in the mid and upper elevations. With disturbance, Vine maple and shiny leaf ceanothus will increase.

Compiled by: Carl Davis, Claudia Narcisco, Terry Lillybridge Wenatchee NF

M242Cn Upper Yakima-Swauk Sandstone Hills

Location: This subsection is located in the state of Washington in the upper Yakima subbasin.

Subsection Concept: This subsection consists of dissected hills along the eastern slope of the Cascade Mountains. These hills are composed of folded inter-bedded sedimentary rocks that have been modified by fluvial and mass wasting processes. The major vegetation is coniferous forest. Climatic conditions are transitional from maritime to continental. This map unit is separated from adjacent units based upon lack of glacial expression, folded bedrock, igneous or metamorphic bedrock, and potential natural vegetation that reflects dry climatic conditions.

Subsection Setting and Ecological Relationships: These hills have an elevation range of 2500 to 7000 feet (762 to 2134 meters). Side slope profiles have straight shapes, slopes range from 30 to 60 percent, and local relief from ridge tops to valley bottoms ranges from 500 to 1500 feet (152 to 457 meters). The folded inter-bedded sedimentary rocks are controlling the shape of the land surface. Bedrock exposures are common. Structural features such as steeply dipping chevrons and hogbacks are common with lesser amounts of dip slopes and scarp slopes. The geologic formations are the Chumstick and Swauk which are predominately sandstone inter-bedded with siltstone and shale. The major geomorphic processes have been mass wasting and fluvial down cutting. Mass wasting processes in the weaker incompetent beds (shale and siltstone) created land slides. Streams have eroded the land slides and downcut into weaker rocks forming valleys. The resistant sandstone beds form predominant ridges.

Mean annual precipitation ranges from 30 to 50 inches (76 to 126 cm). Most precipitation comes in the winter as snow. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C). Maritime air flow through Snoqualmie Pass funnels into this unit strongly affecting climatic conditions.

Stream drainage features include V shaped valleys with trellis and weakly dendritic stream patterns. Tributary drainage density ranges from 5 to 15 per mile. The drainage density, soil regoliths, topographic relief, and usually high storm events produce high sediment delivery. Fine alluvial material has filled and widened ephemeral draws and valley bottoms.

The primary natural disturbance process is fire and debris slides. Natural fire frequency ranges from 100 to over 300 years for stand replacing fires. In the western half of the unit, fire frequencies are in the upper part of the range while in the eastern half they are in the lower part of the range. Large fires can increase debris slide occurrence. Rain on snow and other unusual runoff events can trigger debris slides and seasonal flooding.

Subsection Components:

This subsection consists of one primary landscape setting. This includes dissected sandstone hills.

These dissected sandstone hills are located on low to mid-elevation sites with dominant slope gradients of 30 to 60 percent. These landscapes consist of hogbacks, scarp slopes, dip slopes, and earth flows which usually border structural features. The soils are influenced by cold moderately moist environments, volcanic ash, and colluvium from interbedded bedrock with varying textural properties. The major soils are moderately shallow with sandy loam surfaces and variable textured subsoils depending upon the bedrock. The major soils are classified as Andic Cryochrepts. The potential natural vegetation patterns are influenced by maritime climates along the western boundary and continental conditions along the eastern boundary. Soil moisture is not limiting forest patterns. The dominant potential vegetation is western hemlock and grand fir series to the west and grand fir and subalpine

fir to the east.

Compiled by: Carl Davis, Claudia Narcisco, Terry Lillybridge Wenatchee NF

M242Co Upper Yakima Basin

Location: This subsection occurs in the state of Washington in the upper Yakima subbasin.

Subsection Concept: This subsection consists of a basin along the eastern crest of the Cascade Mountains. This basin is composed of pyroclastic, sedimentary and metamorphic rocks which have been modified by alpine glaciation and fluvial down cutting. The major vegetation is coniferous forest influenced by maritime climatic conditions. This map unit is separated from adjacent units based upon less expression of glaciation or presence of igneous or metamorphic bedrock.

Subsection Setting and Ecological Relationships: This basin has an elevation range of 2500 to 9500 feet (762 to 2896 meters). Side slopes have straight to concave shapes, upper slopes are steep (60 to 90 percent) with excessive rock outcrop. Lower slopes range from 30 to 60 percent and are mantled with glacial drift and colluvium. Local relief from ridge tops to valley bottoms ranges from 1000 to 2000 feet (305 to 610 meters). The dominant types of rocks are a mix of pyroclastic, sedimentary and metamorphic units. The metamorphic rocks occur in the northern tip of the unit and include phyllite, schist, serpentinite, and talc. The pyroclastic and sedimentary rocks occur in the southern part of the unit and include volcanic flows, breccia and tuff interbedded with volcanic sandstones, siltstones, shales and conglomerates. The primary geomorphic process is alpine glaciation which carved out and over steepened stream valleys in the northern part of the unit. Fluvial down cutting has occurred along the southern boundary.

Mean annual precipitation ranges from 50 to 160 inches (125 to 400 cm). Most of the precipitation comes in the winter as snow. The mean annual air temperature is 39 to 45 degrees F (4 to 7 degrees C). Maritime air flow through Snoqualmie Pass funnels into this unit strongly affecting climatic conditions.

Stream drainage features are variable and include both V and U shaped valleys. Tributary patterns are dendritic or parallel and are incised low-order (class 4) streams. Tributary drainage density ranges from 15 to 25 streams per mile. Upper ridges receive tremendous snow packs but are unable to regulate runoff which causes flashy spring stream flows. Near surface ground water, seeps, and springs on lower slopes helps to maintain base flows and low stream temperatures. Higher order streams and rivers have braided to meandering patterns.

The primary natural disturbance process is fire and debris slides. Natural fire frequency ranges from 100 to 300 years for high intensity fires. High intensity, stand replacing fires can drastically increase debris slides. Rain-on-snow events can trigger earth flows, debris slides, and stream channel scouring. Human-caused disturbances are associated with roading and timber harvest.

Subsection Components:

This subsection consists of two primary landscape settings. These include glacial mountains and dissected ridges.

The glacial mountains are located in the upper elevations in the northern part of the unit. Slopes are gentle in cirque basins and trough valley bottoms but exceed 60 percent in other locations. These landscapes include cirque head walls, cirque basins, U shaped trough walls, lateral moraines, alluvial fans, glacial-fluvial flood plains, stream terraces, and flood plains. Upper ridges are dominated by rock outcrop, talus cones, and

avalanche chutes while alluvial fans are common in lower elevations. Soils are influenced by cold moist environments, volcanic ash, and glacial till deposits. The major soils are moderately shallow in upper elevations and deep in the valley positions. These soils have fine sandy loam surfaces and variable textured subsoils with stony or cobbly regoliths. The major soils are classified Andic Cryochrepts and Typic and Haplic Cryohumods. The potential natural vegetation patterns are influenced by strong maritime climatic conditions. The potential natural vegetation is western hemlock, Pacific silver fir, and mountain hemlock series.

The dissected ridges are located in the low to mid elevations in the southern part of the unit. Slopes range from 10 to 50 percent and are comprised of pyroclastic rocks. These landscapes include dissected mountain slopes, alluvial fans, landslides, and valley bottoms. Soils are influenced by cold moist environments, volcanic ash, and bedrock with varying textural properties. The major soils are deep with fine textured surfaces and variable textured subsoils with stony or cobbly regoliths. The major soils are classified as Typic and Haplic Cryohumods. The potential natural vegetation patterns are influenced by maritime climatic conditions. The dominant potential natural vegetation is western hemlock Pacific silver fir, and grand fir on the eastern boundary.

Compiled by: Carl Davis, Claudia Narcisco, Terry Lillybridge Wenatchee NF

M242Cp Naches Mountains

Location: This subsection is located in the state of Washington in the Naches subbasin.

Subsection Concept: This subsection consists of mountains along the eastern crest of the Cascade Mountains. These mountains are composed of a mix of volcanic and metamorphic rocks which have been modified by glaciation, fluvial, and mass wasting processes. The major vegetation is coniferous forest influenced by maritime climatic conditions in the western half of the unit and continental conditions in the eastern half. This map unit is separated from adjacent units based upon differences in volcanic flow characteristics and stronger expressions of glaciation.

Subsection Setting and Ecological Relationships: These mountains have an elevation range of 2500 to 7700 feet (762 to 2347 meters). Side slope profiles are undulating with slopes ranging from 10 to 40 percent. Local relief from ridge tops to valley bottoms ranges from 500 to 1500 feet (152 to 457 meters). Depressions can contain seeps, springs or even small ponds or bogs. Recent indications of slope movement may be present. The dominant types of rocks are a complex mix of volcanics interbedded with pyroclastic flows, ash fall deposits, tuff, breccia, volcaniclastic, and volcanic rich sandstones and conglomerates. Metamorphic rocks primarily phyllite, mica-schist and metavolcanics are significant in the central portion. Several geomorphic processes have been functioning. These include alpine glaciation, mass wasting, fluvial down cutting, and volcanism. Alpine glacial processes have eroded upper drainages along the Cascade Crest. Mass wasting occurs throughout the unit but especially along contact with the basalt plateaus on the eastern boundary.

Mean annual precipitation ranges from 40 to 99 inches (100 to 248 cms). Most of the precipitation occurs in the winter as snow. The mean annual air temperature is 42 to 47 degrees F (6 to 8 degrees C). Maritime air flow through mountain passes funnels into the western half of the unit strongly influencing climatic conditions.

Stream drainage features include V shaped valleys with dendritic and deranged tributary drainage patterns. Tributary drainage density ranges from 5 to 10 streams per mile. Stream patterns have been strongly influenced by volcanic flows and mass wasting.

The primary natural disturbance process is fire and mass wasting. Natural fire frequency ranges from 100 to 300 years for high intensity stand replacing fires. In the western half of the unit, fire frequencies are in the upper part of the range while in the eastern half they are in the lower part of the range. Large fires increase mass wasting processes. Rain on snow and other unusual runoff events can trigger debris slides and seasonal flooding. Human caused disturbances are grazing, fire suppression, and timber harvest practices.

Subsection Components:

This subsection consists of three primary landscape settings. These include glacial mountains, volcanic and pyroclastic flows, and dissected mountain slopes.

The glacial mountains are located along the western margin of the unit along the crest of the Cascade Mountains typically in more resistant bedrock. Slopes are gentle in cirque basins and trough valley bottoms but exceed 60 percent in other locations. These landscapes include cirque head walls, cirque basins, U shaped trough walls, lateral moraines, alluvial fans, glacial-fluvial flood plains, stream terraces, and flood plains. Upper ridges are dominated by rock outcrop, talus cones, and avalanche chutes while alluvial fans are common in lower elevations. Soils are influenced by cold

moist environments, volcanic ash, and glacial till deposits. The major soils are moderately shallow and coarse textured and are classified Andic Cryochrepts and Typic and Haplic Cryohumods. The potential natural vegetation patterns are influenced by strong maritime climatic conditions. The dominant potential natural vegetation consists of Pacific silver fir and mountain hemlock series.

The volcanic and pyroclastic flows are located through out the unit. Slopes range from 10 to 60 percent. These landscapes include gently sloping plateaus, dissected mountain slopes, steep flow escarpments, deep rotational landslides, and shallow earth flows. Seeps and rotational landslides are common along the fringe of flow plateaus. Soils are influenced by cool moist environments, volcanic ash, and variable textured regoliths. The major soils are deep, have fine sandy loam "ashy" surfaces, with fine textured subsoils, and are classified Typic and Xeric Vitricryands. The potential natural vegetation patterns are influenced by moist continental climatic conditions. The dominant potential natural vegetation includes subalpine in the upper elevations, grand fir in the mid elevations, and Douglas-fir series in the lower elevations.

The dissected mountains are prominent in the northern half of the unit but can occur through out. These mountains are associated with volcanic/sedimentary inter-bedded bedrock. Slopes range from 10 to 60 percent. These landscapes include dip slopes, scarp slopes, rotational slides, earth flows, and dissected mountain slopes. The soils are influenced by cool and dry to moist environments, volcanic ash and variable regolith properties. The major soils are moderately deep, have fine sandy loam "ashy" surfaces, with variable textured subsoils, and are classified as Typic and Xeric Vitricryands. The potential natural vegetation patterns are influenced climatic conditions that are transitional from maritime to continental. The dominant potential vegetation include silver fir series in the western portion, while in the eastern portion grand fir series occurs at lower elevations and subalpine fir series in the upper elevations.

Compiled by: Carl Davis, Claudia Narcisco, and Terry Lillybridge Wenatchee NF

M242Cq Entiat-Chelan Hills

Location: This subsection is located in the state of Washington in the lower Entiat and Chelan subbasins.

Subsection Concept: This subsection consists of dissected hills along the eastern slope of the Cascade Mountains. These hills are composed of granitic and metamorphic rocks that have been modified by glacial deposition, periglacial and fluvial processes. The major vegetation is coniferous forest influenced by dry continental climatic conditions. This map unit is separated from adjacent ones based upon the absence of glacial erosion, changes in stream patterns and density, and geologic materials.

Subsection setting and Ecological Relationships: These dissected hill slopes have an elevation range from 1100 to 6700 feet (305 to 2042 meters). Side slope profiles are straight to slightly concave. Ridge tops are relatively broad with gentle undulating relief. Generally slopes range from 10 to 40 percent but rejuvenated slopes along the Mad River and along other stream courses are steeper. Local relief from ridge tops to valley bottoms ranges from 100 to 600 feet (30 to 183 meters). The dominant types of bedrock is granitic and metamorphic. Igneous rocks are predominantly tonalite, gneiss and quartz diorite. The metamorphic rocks are typically gneiss and schist. The primary geomorphic processes are glacial depositions in the upper elevations of the northwest, periglacial freeze thaw, and fluvial down cutting.

Mean annual precipitation ranges from 15 to 59 inches (38 to 148 cm). Most of the precipitation comes in the winter as snow. The mean annual air temperature is 42 to 49 degrees F (6 to 9 degrees C).

The stream drainage features include narrow V shaped valleys with dendritic drainage patterns with short reaches. Tributary drainage density ranges from 10 to 15 drainages per mile. The drainage density and topographic relief create high sediment delivery efficiencies for fine sediment. Alluvial fans have formed at the mouth of all drainages regardless of size. Alluvial material has filled and widened ephemeral draws and valley bottoms. Near surface ground water, seeps and springs are common in the upper Mad River drainage associated with glacial till deposits. Seeps and springs are not common in the rest of the map unit. Stream flows are typically intermittent with interrupted flows with exception to the Mad and Roaring Creek drainages which have perennial flows.

The primary natural disturbance process is fire. In upper elevations, natural fire frequencies range from 50 to 100 years and are high intensity or stand replacing. While in lower elevations, fire frequencies range from five to 10 years and are low intensity. Following fires, small debris slides and gully development usually occurs in incised drainage ways. High intensity storms can cause flashy run off and stream channel scouring. Human-caused disturbances such as historic livestock grazing, fire suppression, and timber harvest practices increased fire severity.

Subsection Components:

This subsection consists of two primary landscape settings. These include high elevation glacial moraines and benches, and highly dissected hill slopes.

The high elevation glacial moraines and benches are located in the north west portion of the map unit at upper elevations. Topography is undulating and slope gradients range from 10 to 30 percent. These landscapes include undulating ground moraines and benches on high elevation sites. Numerous

seeps occur throughout this landscape reflecting high near surface ground water. Soils are influenced by cold moist environments, mantles of volcanic ash, and coarse textured cobbly regoliths. The major soils are moderately deep with fine textured "ashy" surfaces and coarse textured subsoils which are classified as Typic Haplorthods and Cryorthods. The potential natural vegetation patterns are influenced by moist continental climatic conditions and consist of subalpine fir and grand fir series.

The highly dissected hill slopes are located in the central portion of the map unit at elevations from 1000 to 5000 feet. Slope gradients typically range from 20 to 40 except along stream breaks where slopes exceed 60 percent. These landscapes include dissected hill slopes, stream breaks, and alluvial fans. Seeps are not common. The soils are influenced by dry warm environments, mantles of volcanic ash and pumice, and coarse textured regoliths. The major soils are moderately deep with fine textured "ashy" surfaces with coarse textured regoliths and are classified as Xerolls, Vitrandepts and Xerochrepts. The potential natural vegetation patterns are influenced by a rain shadow effect creating dry continental climatic conditions. Soil moisture deficits severely limit forest patterns in low elevations. The potential natural vegetation exhibits a transition from ponderosa pine series associated with grassland shrub-steppe in the low elevations to Douglas-fir and grand fir series in the upper elevations.

Compiled by: Carl Davis, Claudia Narcisco, and Terry Lillybridge, Wenatchee NF

M242Cs Middle Methow Block

Location: This subsection is located in the Methow River drainage of the Eastern Cascades, Washington state.

Subsection Concept: This subsection consists of the uplifted mountains of sedimentary and volcanic rocks of the Cretaceous-Jurassic periods that have been highly sculptured by alpine and continental glaciation and includes glacial cirques and basins, glacial troughs, and glacial valley. The material is of mixed origin that has been modified by glacial, fluvial, and alluvial geomorphic processes. The major vegetative types includes Ponderosa Pine/Fescue at the lower elevations, Douglas Fir at the mid elevations and Subalpine Fir/Sedges at the higher elevations. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors, but most specifically from the Sedimentary and Volcanic bedrock that dominates the area.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 2000 to 8500 feet/610 to 2590 meters. The dominant slope range is 10 to 85 percent. The dominant types of geologic materials are Cretaceous-Jurassic sedimentary and volcanic rocks of the Methow block. The Southwestern margin of the area includes mixed metamorphic and granitic rocks of the Sawtooth range. This area is part of the Methow-Payayten Graben and the Intrusive core complex of the Cascade Range. A strong northwest/southeast trending structure occurs on this landscape. The primary geomorphic process in these landscapes are glaciation with some fluvial and alluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the valley bottom to 50 inches/127 cms at the higher elevations. Most precipitation occurs in the winter season with 60 percent of the precipitation falling as snow and 20 percent falling in June as rain. The mean annual air temperature is 36 to 44 degrees F. (2 to 6.5 degrees C.)

The Methow River, Twisp River, Lost River and Goat Creek are the main stream systems within this area. The landscape is moderately to highly dissected. There are small lakes and reservoirs such as BlackPine Lake, Crescent Lake and Williams Lake occur at mid to high elevations in tributaries to the main river systems. Natural wetlands also occur in the valley floor adjacent to the major rivers and its tributaries.

The primary natural disturbance processes are fire, flooding, insect and disease, and slope failures. Insect and disease problems (such as Pine Bark Beetle, Spruce Bud Worm, Mistletoe, and root Rot) occur over scattered areas of the forested lands. Slope failures, mostly in the form of debris avalanches occur predominately in the higher elevations, especially in the Twisp River drainage. Local periodic flooding of smaller streams occurs from high intensity storms. Human-caused disturbances include logging and grazing along with some limited mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include glacial cirques, glacial troughs, and glacial valley bottoms.

The glacial cirques are located on high elevation ridges with dominant slope gradients from 25 percent to nearly vertical. These landscapes include cirque headwalls, cirque floors or basins, and cirque lakes that are formed in bedrock and glacial till. These landscapes are dominated by rock outcrop and talus. Where soils do occur they are primarily deep extremely cobbly or gravelly loamy sands. These soils are classified as Lithic Cryochrepts, Typic Vitricryands and Typic Cryochrepts. The dominant potential natural vegetation is Subalpine Fir, Willows, and Dunhead Sedge.

The glacial troughs are located between low to high elevation with dominant

slopes of 30 to 75 percent. These landscapes include the trough walls and lateral glacial moraines. About one-third to one-half of the area is rock outcrop, talus, or shallow soil (soils less than 20 inches to bedrock). The shallow soils have sandy loam and loamy sand textures with a high rock content. The deeper soils have soil textures of very cobbly sandy loams and gravelly loams, overlain by volcanic ash at the higher elevations. The soils are classified as Lithic Cryochrepts, Entic Ultic Haploxerolls, Typic Xerochrepts and Fluventic haploxerolls. The dominant potential natural vegetation is Douglas Fir on the drier sites and Subalpine Fir/Willows/Sedges on the more moist sites.

The glacial valley's occur at the lower to middle elevation with dominant slopes gradients from 5 to 30 percent. These landscapes include glacial moraines, stream terraces, and floodplains. The dominant soils are deep and extremely cobbly loamy sand to sand substrat overlain by loamy and sandy loam layers of alluvium. Soils are more poorly drained in the flatter valley bottoms. The soils are classified as Typic Vitricryands, Fluventic haploxerolls, Entic Ultic Haploxerolls, and Vitrandic Cryoboralfs. The dominant potential natural vegetation is Douglas fir, Spruce, Willows and sedges on the more moist sites and Ponderosa Pine/Douglas Fir/Idaho Fescue on the more open drier sites.

Compiled By: Kenneth J. Radek, Soil Scientist, Okanogan National Forest

M242Ct Upper Methow Block

Location: This subsection is located on the Pacific Crest of the Cascades in Washington state.

Subsection Concept: This subsection consists of the uplifted mountains composed largely of Cretaceous sedimentary rocks of Methow Block that have been highly sculptured by alpine and continental glaciation and includes glacial cirques and basins, glacial troughs, and glacial valley. The material is of mixed origin that has been modified by glacial, fluvial, and alluvial geomorphic processes. The major vegetative types includes Silver Fir, Mountain Hemlock, Heather and sedge occur on the more moist sites at the higher elevations. Western Hemlock occurs at the lower elevations on drier habitats. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors, but most specifically from the Sedimentary bedrock and the moist, maritime forests that dominates the vegetation.

Subsection Setting and General Characteristics: These glaciated mountains have a elevation range of 900 to 8500 feet/600 to 2550 meters. The dominant slope range is 10 to 85 percent. The dominant types of geologic materials are Cretaceous sedimentary rocks of the Methow block. South of Azurite Peak are acid intrusive rocks of tertiary age. This area is part of the Methow-Pasayten Graben and the Intrusive core complex of the Cascade Range. A strong northwest/southeast trending structure occurs on this landscape. The primary geomorphic process in these landscapes are glaciation.

Mean annual precipitation ranges from 30 inches/75 cms at the valley bottom to 80 inches/200 cms at the higher elevations. Most precipitation occurs in the winter season with 60 percent of the precipitation falling as snow and 20 percent falling in June as rain. The mean annual air temperature is 34 to 42 degrees F. (1 to 6 degrees C.)

The Methow River, Pasayten River and Granite Creek are the main stream systems within this area. The landscape is moderately to highly dissected. There are numerous small lakes such as Rainey Lake, Blue Lake and Lake of the Pines that occur at high elevations in tributaries to the main river systems. Natural wetlands also occur adjacent to the tributaries of the main drainages and its tributaries.

The primary natural disturbance processes are fire, flooding, insect and disease, and slope failures. Insect and disease problems (such as Pine Bark Beetle, Spruce Bud Worm, Mistletoe, and root Rot) occur over scattered areas of the forested lands. Slope failures, mostly in the form of debris avalanches occur predominately in the higher elevations, especially in the Twisp River drainage. Local periodic flooding of smaller streams occurs from high intensity storms. Human caused disturbances are limited to some short season grazing and limited mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include glacial cirques, glacial troughs, and glacial valley bottoms.

The glacial cirques are located on high elevation ridges with dominant slope gradients from 25 percent to nearly vertical. These landscapes include cirque headwalls, cirque floors or basins, and cirque lakes that are formed in bedrock and glacial till. These landscapes are dominated by rock outcrop and talus. Where soils do occur they are primarily deep extremely cobbly or gravelly loamy sands. These soils are classified as Lithic Cryochrepts, Typic Vitricryands and Andic Cryochrepts. The dominant potential natural vegetation is Silver Fir, Mountain Hemlock, heather and sedges.

The glacial troughs are located between low to high elevation with dominant

slopes of 30 to 75 percent. These landscapes include the trough walls and lateral glacial moraines. About one-half of the area is rock outcrop, talus, or shallow soil (soils less than 20 inches to bedrock). The shallow soils have sandy loam and loamy sand textures with a high rock content. The deeper soils have soil textures of very cobbly sandy loams and gravelly loams, overlain by volcanic ash at the higher elevations. The soils are classified as Lithic Cryochrepts, Entic Ultic Haploxerolls, Typic Vitricryands, Andic Haplocryods and Fluventic Haploxerolls. The dominant potential natural vegetation is Silver Fir, Mountain Hemlock, heather and sedges.

The glacial valley's occur at the lower to middle elevation with dominant slopes gradients from 5 to 30 percent. These landscapes include glacial moraines, stream terraces, and floodplains. The dominant soils are deep and extremely cobbly loamy sand to sand substrat overlain by loamy and sandy loam layers of alluvium. Soils are more poorly drained in the flatter valley bottoms. The soils are classified as Typic Vitricryands, Fluventic Haploxerolls, Entic Ultic Haploxerolls, and Andic Cryoboralfs. The dominant potential natural vegetation is Western Hemlock on the drier sites and Silver Fir and Mountain Hemlock on the more moist sites.

Compiled By: Kenneth J. Radek, Soil Scientist, Okanogan National Forest

M242Cu Cascade Highlands

Location: This subsection is located in the Methow River drainage of the Eastern Cascades, Washington state.

Subsection Concept: This subsection consists of the uplifted mountains of granitic rock types of the Mesozoic period that have been highly sculptured by alpine and continental glaciation and includes glacial cirques and basins, glacial troughs, and glacial valley. The material is of mixed origin that has been modified by glacial, fluvial, and alluvial geomorphic processes. The major vegetative types includes Ponderosa Pine/Fescue at the lower elevations, Douglas-Fir at the mid elevations and Subalpine Fir/Sedges at the higher elevations. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors but mainly on the Granitic bedrock that dominates the area.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 2000 to 8500 feet/600 to 2550 meters. The dominant slope range is 25 to 95 percent. The dominant types of geologic materials are Mesozoic intrusive rocks that include tonalite, grandiorite, and biotite granite. Minor mixed metamorphic and igneous rocks include shist, amphibolite, gneiss, marble and quartz monzonite. A strong northwest/southeast trending structure occurs on this landscape. The primary geomorphic process in these landscapes are glaciation with some fluvial and alluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the valley bottom to 40 inches/102 cms at the higher elevations. Most precipitation occurs in the winter season with 60 percent of the precipitation falling as snow and 20 percent falling in June as rain. The mean annual air temperature is 36 to 44 degrees F. (2 to 6.5 degrees C.)

The Chewuch River, Toats Coulee, and Boulder Creek are the main stream systems within this area. The landscape is moderately to highly dissected. There are numerous small lakes throughout all elevations in this unit. This unit has the largest area of mid to high elevation wetlands and meadows, with several over 600 acres/240 hectares in size.

The primary natural disturbance processes are fire, flooding, insect and disease, and slope failures. Insect and disease problems (such as Pine Bark Beetle, Spruce Bud Worm, Mistletoe, and root Rot) occur over more than 30 percent of the forested lands. Slope failures, mostly in the form of debris avalanches occur predominately in the higher elevations. Local periodic flooding of smaller streams occurs from high intensity storms. Human-caused disturbances include logging and grazing along with some limited mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include glacial cirques, glacial troughs, and glacial valley bottoms.

The glacial cirques are located on high elevation ridges with dominant slope gradients from 25 percent to nearly vertical. These landscapes include cirque headwalls, cirque floors or basins, and cirque lakes that are formed in bedrock and glacial till. These landscapes are dominated by rock outcrop and talus. Where soils do occur they are primarily deep extremely cobbly or gravelly loamy sands. These soils are classified as Lithic Cryochrepts and Typic Cryochrepts. The dominant potential natural vegetation is Subalpine Fir, Willows, and Dunhead Sedge.

The glacial troughs are located between low to high elevation with dominant slopes of 30 to 75 percent. These landscapes include the trough walls and lateral glacial moraines. About one-fourth to one-third of the area is rock outcrop, talus, or shallow soil (soils less than 20 inches to bedrock). The

shallow soils have sandy loam and loamy sand textures with a high rock content. The deeper soils have soil textures of very cobbly sandy loams and gravelly loams, overlain by volcanic ash at the higher elevations. The soils are classified as Lithic Cryochrepts, Entic Ultic Haploxerolls, Typic Xerochrepts and Fluventic Haploxerolls. The dominant potential natural vegetation is Douglas Fir on the drier sites and Subalpine Fir/Willows/Sedges on the more moist sites.

The glacial valley's occur at the lower to middle elevation with dominant slopes gradients from 5 to 30 percent. These landscapes include glacial moraines, stream terraces, and floodplains. The dominant soils are deep and extremely cobbly loamy sand to sand substrat overlain by loamy and sandy loam layers of alluvium. Soils are more poorly drained in the flatter valley bottoms. The soils are classified as Typic Cryandepts, Fluventic Haploxerolls, Entic Ultic Haploxerolls, and Typic Cryoboralfs. The dominant potential natural vegetation is Douglas fir, Spruce, Willows and sedges on the more moist sites and Ponderosa Pine/Douglas Fir/Idaho Fescue on the more open drier sites.

Compiled By: Kenneth J. Radek, Soil Scientist, Okanogan National Forest

M242Cv Lapine-Sycan Basins

Location: This subsection is located in south-central Oregon south of the town of Lapine.

Subsection Concept: This subsection consists of the basins that lie within the ash fallout zone from Mount Mazama. These basins contain thick deposits of coarse sand-sized ash and pumice. The major general vegetative type is forested and grades to grass-sedge plant communities near the lakes. This map unit is separated from adjacent subsections based upon the basin landform.

Subsection Setting and General Characteristics: This unit consists of wet depression basins that have a dominant elevation range of 4,300 to 5,000 feet (1311 to 1524 meters). The dominant slope range is 0 to 2 percent. The unit contains open water lakes and meandering streams. The parent material is alluvium. The primary geomorphic process in this landscape is fluvial.

Mean annual precipitation ranges from 16 inches (40 cms) to 30 inches (75 cms). Precipitation is primarily in the form of snow. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

The primary natural disturbance process is fire. Human-caused disturbances include timber harvesting, livestock grazing recreation and rural development in the Lapine Basin.

Subsection Ecological Relationships

This subsection consists of one primary landscape component: the basins.

The basins are located on low elevational sites with dominant slope gradients from 0 to 2 percent. The landscapes include broad flats and narrow meandering streams. The soil moisture regime is typically aquic with the slightly better drained sites being xeric. The soil temperature regime is cryic. The primary soils are very deep to bedrock and are poorly drained. The soils have a water table at or above the soil surface in late winter and spring. In the late summer and fall water tables drop below about 3 feet. The buried soil (prior to Mt. Mazama deposition) typically occurs at 40 to over 60 inches from the surface. In the Lapine Basin the surface is typically coarse sandy loam with a loamy coarse sand subsoil and substratum. The Klamath Marsh and Sycan Marsh Basins contain less ash and pumice in the soil surface and are wetter. The surface layer is typically a silt loam high in organic matter. The subsoil and substratum is stratified diatomaceous earth, along with loamy coarse sand ash. Typic Cryaquands and Limnic Borosaprists dominate the landscape. The slightly higher better drained soils are Aquic Vitricryands. The dominant potential natural vegetation consists of lodgepole pine, antelope bitterbrush and Idaho fescue on slightly higher better drained sites. Tufted hairgrass, Nebraska sedge and reedgrass dominate the wetter soils.

Compiled by: Thor Thorson, Natural Resources Conservation Service

M261Da Shasta Valley

Location: This subsection is located in extreme north-central California between the Cascade Range and the Klamath Mountains.

Subsection Concept: This subsection consists of a broad, mid-elevation mountain valley. It lies in the rain shadows of Mt. Shasta and the Klamath and Siskiyou Mountains. It is not forested except by sparse stands of western juniper. It is separated from the upper valley segment because this map unit is more arid.

Subsection Setting and General Characteristics: Shasta Valley ranges in elevation from 2500 to 3500 feet. The slope ranges from 0 to 25%. It is formed in Quaternary Alluvium from extrusive igneous rocks in the Cascade Range that lies to the east and mixed intrusive igneous and metamorphic rocks from the Klamath Mountains that lie to the west. Much of the valley overlies an ancient lake bed. The primary geomorphic process is fluvial.

Mean annual precipitation ranges from 8 to 15 inches. Most precipitation occurs in winter months and is evenly distributed as rain and snow. The mean annual air temperature is about 48 degrees F.

The characteristic surface water features associated with this subsection are rivers and streams. While the valley receives little precipitation, it receives runoff from the mountains that surround it. The Shasta River lies in the bottom of the valley. Its waters are heavily used for irrigated agriculture and grazing. High ground water areas occur in valley bottoms and represent a minor component of this map unit.

The primary natural disturbance process is wildfire. The primary human-caused disturbance are agriculture and grazing.

Subsection Ecological Relationships: Valley stream terraces and fans are the single landscape setting recognized in this subsection. This landscape includes terraces, basins and outwash fans. The soils are generally deep, saline-alkali and exhibit hardpans. The soils are classified as Typic Durorthids and Durixerolls with minor components of Aquic Durorthids. The dominant natural vegetation is Juniper-sage or short grass prairie.

Compiled By: Shasta-Trinity NF. P.VanSusteren

M261Db Medicine Lake Highlands and Lava Flows

Location: This subsection is located in north-central California.

Subsection Concept: This subsection consists of uplands and lava flows that emanated from the base of the Medicine Lake Shield Volcano. This is an active volcano.

Subsection Setting and General Characteristics: These recent lava flows and uplands have an elevation range from 4400 to 8000 feet. The slope range is 0 to 60 percent. The dominant lithologies are basalts, pyroclastics, rhyolites, and obsidian. The primary geomorphic process in these landscapes is volcanic. Mean annual precipitation is 15 to 40 inches. Most precipitation occurs in the winter months and falls as snow. The mean annual air temperature is 43 to 48 degrees F.

The only characteristic water feature associated with this subsection is Medicine Lake and a few smaller high elevation ponds. Other water features are completely absent.

The primary natural disturbance processes are wildfire, insect infestations, and volcanic eruptions. Human-caused disturbances include forest management, geothermal exploration, dispersed recreation and rural residential development.

Subsection Ecological Relationships: There are four primary landscape settings in this map unit: rampart volcanos, pumice fields, recent lava flows and older flows on lower slopes.

The rampart volcanos are the peaks around and within the caldera. Some of these are remanant of the collapse of the summit, others are cinder cones that rose out of vents that were created by the collapse. The rampart volcanos are typically 30 to 60 percent slopes. Soils are either deep and weathered from cinder material or shallow and weathered from bedrock and wind-laid ash. They are classified as Vitrandic Xerorthents and Lithic Xerorthents. The dominant potential natural vegetation is red fir forests with lodgepole pine and mountain hemlock.

The pumice fields are rhyolitic pumice deposits that range from 1 to 10 feet in depth. The surface soils are extremely pumiceous, buried soils are typically very cobbly to fragmental. These soils are classified as Vitrandic Xerorthents and Thaptic Vitrixerands. The dominant potential natural vegetation is lodgepole pine forests and red fir forests.

The recent lava flows landscape setting includes obsidian flows, block flows and flood basalt flows. All are very recent and all are sparsely vegetated or unvegetated. All are unweathered rock and have essentially no soil development.

The older flows on lower slopes are a matrix landscape setting and are distributed throughout the subsection. The range in slope from 5 to 25 percent. They are somewhat eroded lava flows that emanated from the flanks of the Medicine Lake Volcano. The primary soils are medial-skeletal or medial over loamy-skeletal with very cobbly subsoils. Basaltic rock outcrops are frequent. The soils are classified as Humic Haploxerands and Typic Haploxerands. The dominant potential natural vegetation is white fir forest, red fir forest and ponderosa pine/bitterbrush forests.

Compiled By: Shasta-Trinity NF. P.VanSusteren (Revised by J. Nesser, R-1)

M261Dc Shingletown-Paradise Lahars and Terraces

Location: This subsection is located in north central California. It lies between the highlands surrounding Lassen Peak and the Sacramento River Valley.

Subsection Concept: This subsection was delineated as a unit that contained a mid-elevation band between the Lassen-Almanor Uplands and the foothills above the Sacramento Valley. Elevations range from 2000 to 4600 ft. Slope ranges from nearly level to moderately sloping. It is formed in alluvium and on lahars that emanated from the Lassen Peak uplands. Primary geomorphic processes are volcanic and alluvial.

Mean annual precipitation ranges from 25 to 50 inches. Most of the precipitation falls in winter months and is evenly distributed as rain and snow. The mean annual air temperature is 45 to 48 degrees (F).

The characteristic surface water features are the many streams that flow off the upland to the east. These include Battle Creek, Deer Creek and Paynes Creek.

The primary natural disturbance process is wildfire, almost 20% of this subsection was burned over in the Fountain Fire of August 1992. Human - caused disturbance processes are wildfire, forest management, rural residences and diversion of streams for irrigation and power generation.

Subsection Ecological Relationships: This subsection is characterized as a gently sloping, westward facing series of lava flows, lahars and outwash terraces. It is highly dissected and deeply incised with the many streams that flow off the uplands to the east. Soils range from shallow on lava flows to deep on the stream terraces. Soils are classified as Ultic Haploxeralfs, Lithic Haploxeralfs. The dominant vegetation types are mixed conifer forests, white fir forests and oak scrubland.

Compiled by: Shasta NF. P.VanSusteren

M261Dd High Cascades

Location: This Subsection is located on the Cascade Range crest. It crosses north-central California from the Oregon border to Mt. Shasta.

Subsection Concepts: This subsection consists of the crest of the Southern Cascades. It is made up of overlapping volcanic formations including lava flows, pyroclastic deposits, moraines, outwash fans, mudflows, etc. Mt. Shasta is regarded as an active volcano. These peaks are strongly influenced by alpine glaciation. Vegetation types are high elevation true fir forests, subalpine fir forests, mixed alpine forests and a very sparsely vegetated zone above tree line. This map unit was delineated on the basis of its high elevation and recent volcanic formations.

Subsection Setting and General Characteristics: This series of volcanic peaks have a general elevation range of 4800 to 8,500 ft. although Mt. Shasta rises to 14,162 ft. The slopes range from 15 to 100 percent. The dominant lithology is Pliocene and Pliostocene volcanics. The primary geomorphic processes on this landscape are volcanic and glacial.

Mean annual precipitation ranges from 30 on the northern peaks to 80 inches on Mt. Shasta. Most precipitation occurs during the winter months and essentially all falls as snow. The mean annual air temperature is about 40 degrees F. except in the alpine zone of Mt. Shasta where it is much lower.

The characteristic water features associated with this subsection is mountain streams. These streams are mostly intermittent and include little or no riparian zone. Because of the very high infiltration capacity of volcanic soils, the drainage pattern is sparsely dissected. A few subalpine ponds are found in glacial valleys.

The primary natural disturbance processes are wildfire, climatically triggered mudflows, and volcanic eruptions. Human-caused disturbances include forest management, forest recreation, wildfires and grazing.

Subsection Ecological Relationships: This subsection consists of two primary landscape settings. These are: the alpine and subalpine zones and the high elevation true fir forests.

The alpine and subalpine zone exists mainly on Mt. Shasta where a large area exists above tree line which is about 8000 to 8500 ft. elevation. Only small areas on Ash Creek Butte, the Whaleback and Gooseneck Mt. are in this zone. These landscapes are characterized as steep, glaciated lava flows and glacial deposits. Little or no soil formation has occurred. The primary soil mapping unit is rubbleland - talus, or scree slopes. Where soils do occur, they are classified as Vitrandic Cryorthents and Vitrandic Cryopsamments. Most of the alpine zone is very sparsely vegetated or unvegetated. The dominant potential natural vegetation is an alpine mixed forest consisting of dwarfed red fir, white bark pine, lodgepole pine and mountain hemlock.

The high elevation true fir forest zone is located on the upper slopes of the High Cascades. These landscape settings are characterized by smooth mountain lava flow sideslopes with frequent rock outcrops. Some have been affected by glaciation. All are covered with a layer of wind-laid volcanic ash. While the landscape has a significant proportion of rock outcrop, the primary soils are deep and are usually ashy over loamy-skeletal or medial-skeletal. These soils are classified as Typic Haploxerands and Humic Haploxerands. The dominant potential natural vegetation types are red fir forest and white fir forest.

Compiled by: Shasta-Trinity NF. P.VanSusteren, Klamath NF. T.Laurent

M261De Klamath Foothills, Oak-Grassland

Location: This subsection is located in the rolling foothills east of Medford, Oregon.

Subsection Concept: This subsection consists of rolling foothills underlain by a mix of igneous extrusive rocks. The major general vegetation type is grassland with scattered Oregon white oak forests. This map unit is separated from similar subsections because of the gently rolling foothill topography as compared with the lower elevation Rogue River floodplain and terraces. The adjacent higher elevation Klamath Mountains, Douglas-fir Forest Subsection lacks the savannah grassland vegetation.

Subsection Setting and General Characteristics: These foothills have an elevation range of 1500 to 4000 feet (457 to 1219 meters). The dominant slope range is 12 to 50 percent but ranges from 1 to 70 percent. The dominant types of rocks are weathered tuff, breccia and andesite. The primary geomorphic process in these landscapes is sheet and rill erosion of highly weathered and decomposed rock and soils.

Mean annual precipitation ranges from 20 inches (50 cms) at lower elevations to 40 inches (100 cms) at higher elevations. Precipitation is mostly in the form of rain from about November through April. The mean annual air temperature is 45 to 52 degrees F (7 to 11 degrees C).

Water is lacking in late summer and early fall except for small water impoundment structures for livestock grazing.

The primary natural disturbance process is fire. Human-caused disturbances include livestock grazing and homesite development at the lower elevations.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the rolling foothills:

The rolling foothills are located on low to mid-elevation sites with dominant slope gradients of 12 to 50 percent. These landscapes include the rolling hills and associated drainageways that have formed in the weathered tuff, breccia and andesite. The soil moisture regime is xeric and the soil temperature regime is mesic. The primary soils are moderately deep and shallow to bedrock. The surface is typically loam or clay loam with a clay subsoil. Lithic Ultic Haploxerolls, Ultic Argixerolls and Leptic Haploxererts dominate the landscape. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, California black oak, Oregon white oak, wedgeleaf ceanothus, Pacific Madrone and scattered ponderosa pine and Douglas-fir.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Df Klamath Mountains, Douglas-fir Forest

Location: This subsection is located in the Klamath Mountains east of Medford, Oregon.

Subsection Concept: This subsection consists of that part of the Klamath Mountains which is dominated by Douglas-fir. The mountain slopes are underlain by a mix of igneous extrusive rocks and pyroclastic materials. This map unit is separated from similar subsections because of the dominance by Douglas-fir as the major overstory species.

Subsection Setting and General Characteristics: These mountains have an elevation range of 1500 to 4000 feet (457 to 1219 meters). The dominant slope range is 12 to 60 percent. The dominant slope on the ash flows along the Rogue River is 1 to 12 percent. The dominant types of rocks are weathered basalt, andesite and breccia in the mountains, and ash and pumice on the ash flows along the Rogue River. The primary geomorphic process in these landscapes is fluvial. Mass wasting events generally occur only after prolonged or severe storms.

Mean annual precipitation ranges from 30 inches (75 cms) at lower elevations to 60 inches (150 cms) at higher elevations. Precipitation is mostly in the form of rain from about November through April. The mean annual air temperature is 45 to 52 degrees F (7 to 11 degrees C).

There are numerous perennial and intermittent drainages.

The primary natural disturbance process is fire. Human-caused disturbances include timber harvesting and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape components, the steeply sloping sideslopes, the gentle lower slopes and the ash flows. The soil moisture regime is xeric and the soil temperature regime is mesic for all components.

The steep mountain sideslopes are located on low to mid-elevation sites with dominant slope gradients from 30 to 60 percent. These landscapes include sideslopes, backslopes and headwalls that have formed in weathered basalt, andesite and breccia. The primary soils are moderately deep and deep to bedrock. The surface is typically gravelly loam with very gravelly or very cobbly loam or clay loam subsoils. Dystric Xerochrepts, Dystric Lithic Xerochrepts and Ultic Haploxeralfs dominate the landscape. The dominant potential natural vegetation consists of Douglas-fir, sugar pine, Pacific Madrone, Cascade Oregon-grape, vinemaple and snowberry with minor amounts of white fir, western hemlock and ponderosa pine.

The more gentle slopes are located on low to mid-elevation sites with dominant slope gradients from 5 to 30 percent. These landscapes include toeslopes and ridge tops that have formed in weathered basalt, andesite and breccia. The primary soils are deep and moderately deep to bedrock. The surface is typically loam or gravelly loam with gravelly loam, loam or clay loam subsoils. Ultic Haploxeralfs and Typic Palexerults dominate the landscape. The dominant potential natural vegetation consists of Douglas-fir, sugar pine, Pacific Madrone, Cascade Oregon-grape, vinemaple and snowberry with minor amounts of white fir, western hemlock and ponderosa pine.

The ash flows occur along the Rogue River on low to mid elevation sites with dominant slope gradients of 1 to 12 percent. These landscapes include broad alluvial flats that have formed in ash and pumice. The primary soils are very deep bedrock. The surface soil is typically sandy loam with sandy loam or very cobbly sandy loam subsoils. Vitrixerands and Entic Xerumbrepts dominate the landscape. The dominant potential natural vegetation consists of

Douglas-fir, sugar pine, Pacific Madrone, Cascade Oregon-grape, vinemaple and snowberry with minor amounts of white fir, western hemlock and ponderosa pine.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Dg Klamath Mountains, White Fir Forest

Location: This subsection is located in the Klamath Mountains east of Medford, Oregon.

Subsection Concept: This subsection consists of that part of the Klamath Mountains which is dominated by white fir. The mountain slopes are underlain by a mix of igneous extrusive rocks and pyroclastic materials. This map unit is separated from similar subsections because of the dominance by the white fir as the major climax overstory species.

Subsection Setting and General Characteristics: These mountains have an elevation range of 3500 to 5500 feet (1067 to 1676 meters). The dominant slope range on the more highly weathered tuffs is 12 to 35 percent. The dominant slope range on the less weathered andesites, breccias and basalts is 12 to 70 percent. Wet basins and drainageways have slopes of 1 to 8 percent. The dominant types of rocks are weathered tuffs, breccias, andesite and basalts. The primary geomorphic processes in these landscapes are sheet and rill erosion of weathered rock and soil.

Mean annual precipitation ranges from 30 inches (75 cms) at lower elevations to 50 inches (125 cms) at higher elevations. Precipitation is an equal mixture of rain and snow from about November through April. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

There are numerous perennial and intermittent drainages.

The primary natural disturbance process is fire. Human-caused disturbances include timber harvesting.

Subsection Ecological Relationships:

This subsection consists of three primary landscape components: the mountain slopes underlain by weathered tuffs; the mountain slopes underlain by basalts, andesites and breccias; and the basins. For all three components, the soil moisture regime is xeric and the soil temperature regime is frigid with higher peaks above 6000 feet being cryic.

The mountain slopes underlain by weathered tuffs occur on mid-elevation sites with dominant slope gradients of 12 to 35 percent. The primary soils are very deep to bedrock. The surface layer is typically loam with a clay or clay loam subsoil. Typic Argixerolls dominate the landscape. The dominant potential natural vegetation consists of white fir, Douglas-fir, snowberry, creambush oceanspray, Pacific serviceberry and western princess pine.

The mountain slopes underlain by basalts, andesite and breccias occur on mid-elevation sites with dominant slope gradients of 12 to 70 percent. The primary soils are moderately deep and deep to bedrock. The surface layer is typically loam or cobbly loam with gravelly clay loam or very cobbly loam subsoils. Typic Xerochrepts and Pachic Ultic Argixerolls dominate the landscape. The dominant potential natural vegetation consists of white fir, Douglas-fir, snowberry, creambush oceanspray, Pacific serviceberry and western princess pine.

The nearly level to gently sloping basins and drainageways are located on mid elevation sites with dominant slope gradients of 1 to 8 percent. The primary soils are very deep to bedrock. The soils have seasonal high water tables in late winter through spring. The soil is typically clay throughout the profile. Xeric Endoaquerts dominate the landscape. The dominant potential natural vegetation consists of tufted hairgrass, meadow barley and sedge.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Dh Klamath Mountains, Red Fir Forest

Location: This subsection is located in the Klamath Mountains in and around Crater Lake National Park.

Subsection Concept: This subsection consists of that part of the Klamath and southern Cascade Mountains above 6000 feet which is dominated by red fir. These mountain slopes are underlain by andesite, rhyolite and basalt. This map unit is separated from similar subsections because of the dominance by the red fir as the major climax overstory species.

Subsection Setting and General Characteristics: These mountains have an elevation range of 6000 to 8000 feet (1829 to 2438 meters). The dominant slope gradient range is 5 to 60 percent. The dominant types of rocks are andesite, rhyolite and basalt. The primary geomorphic process in these landscapes is fluvial. High energy streams carry large quantities of debris during major storms and spring runoff.

Mean annual precipitation ranges from 50 inches (125 cms) at lower elevations to 65 inches (163 cms) at higher elevations. Precipitation is primarily in the form of snow. The mean annual air temperature is 38 to 45 degrees F (3 to 7 degrees C).

Crater Lake and numerous small alpine lakes occur within this subsection.

The primary natural disturbance process is fire. Human-caused disturbances include timber harvesting and recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the mountain slopes.

The mountain slopes occur on high elevation sites with a dominant slope gradient of 5 to 60 percent. These landscapes consist of ridge tops and sideslopes that have formed in andesite, rhyolite and basalt. The soil moisture regime is udic and the soil temperature regime is cryic. The primary soils are very deep to moderately deep to bedrock. The surface is typically cobbly fine sandy loam with a very cobbly fine sandy loam subsoil. Cryothods, Cryochrepts and Vitricryands dominate the landscape. The dominant potential natural vegetation consists of red fir, Noble fir, Pacific rhododendron, beargrass, big huckleberry, mountain hemlock and white fir.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Ga Klamath-Goose Lake Basin Floor

Location: This subsection is located in south-central Oregon in the Klamath Basin and Goose Lake Valley

Subsection Concept: This subsection consists of flood plains and terraces of the Klamath Basin and Goose Lake valley. The major general vegetative type is shrub-grassland. This map unit is separated from similar subsections based upon differences in parent material and landform.

Subsection Setting and General Characteristics: These terraces and flood plains have an elevation range of 4000 to 5000 feet (1219 to 1524 meters). The dominant slope range is 0 to 5 percent with ranges up to 15 percent on the older and higher, dissected terraces. The dominant type of geologic material is stratified recent and older alluvium. The primary geomorphic processes in these landscapes is fluvial.

Mean annual precipitation ranges from 13 inches (33 cms) at lower elevations to 18 inches (45 cms) at higher elevations. Precipitation is primarily in the form of spring and fall rains with significant snowfall in the winter and occasional summer thunderstorms. The mean annual air temperature is 45 to 50 degrees F (7 to 10 degrees C).

There are large open water lakes.

The primary natural disturbance process is flooding and submergence with sluffing from terrace escarpments. Human-caused disturbances are mainly drainage and irrigated agriculture.

Subsection Ecological Relationships:

This subsection consists of three primary landscape components: the flood plains, the low terraces, and the higher, older terraces. The soil moisture regime is xeric, with the wetter soils on the floodplains and low terraces being aquic. The soil temperature regime is mesic.

The floodplains are located on low elevation sites with dominant slope gradients of 0 to 2 percent. These landscapes include the stream channels and associated flood plains that have formed in stratified recent and older alluvium. The primary soils are very deep to bedrock and internal drainage is poor. The surface layer is typically loam with loam or clay loam subsoil and a loam or silt loam substratum. These soils are subject to occasional or frequent flooding and are classified as Cumulic Haploxerolls and Fluvaquentic Haploxerolls. The dominant potential natural vegetation consists of basin wildrye and basin big sagebrush with lesser amounts of inland saltgrass and black greasewood.

The low terraces are located on mid-elevation sites with dominant slope gradients of 0 to 2 percent. The landscapes include the terrace top that has formed in alluvium. Due to extensive reclamation, primarily in the Klamath Basin, the hydrology in terms of water tables and ponding in these soils is intensively controlled by dikes and pumps. The soils are typically saline and sodic and internal drainage is poor. Under natural conditions the soils are subject to ponding or rare flooding during the snowmelt period. Aquandic Argialbolls, Typic Natrixeralfs, Aquic Haplodurids, Mollic and Typic Halaquepts and Aquic Haploxererts are the dominate soils on this segment of the landscape. The dominant potential natural vegetation consists of inland saltgrass, basin wildrye, black greasewood, nuttall alkali grass and Baltic rush.

The older terraces are located on mid-elevation sites with dominant slopes from 0 to 15 percent. These landscapes include the nearly flat terrace top and steep escarpment that have formed in older alluvium. The primary soils are deep to bedrock, but typically have a hardpan or dense clay layer within

40 inches of the soil surface. The surface is typically silt loam or loam with a clay loam or clay subsoil. The substratum is stratified with various amounts of gravel. Pachic Agixerolls, Abruptic Durixerolls, and Pachic Haploxerolls are the dominate soils on these terraces. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, antelope bitterbrush and mountain big sagebrush.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Gb Modac Basalts, Forested

Location: This subsection is located in south-central Oregon and extends into northeastern California.

Subsection Concept: This subsection consists of forested uplands with intermingled open shrub-grassland areas, wet meadows and narrow flood plains. The uplands are underlain by basalt and andesite, while the meadows and flood plains consist of alluvium. This map unit is separated from similar subsections based upon parent material and vegetation. The adjacent Klamath Basin Grasslands subsection has a shrub-grassland vegetation. The adjacent Modoc Pyroclastic Forested subsection has tuffaceous bedrock. The adjacent Lapine Pumice Flats subsection has a thick mantle of ash on the soil surface.

Subsection Setting and General Characteristics: These uplands consist of mountains and plateaus that have an elevation range of 4000 to 8000 feet (1219 to 2438 meters) with the majority of the unit below 6500 feet (1981 meters). The dominant slope range is 0 to 40 percent. The dominant types of rocks are basalt and andesite. The primary geomorphic processes in these landscapes are fluvial and alluvial. The landscapes are fairly mature with minor rockfalls and sheet and rill erosion dominant.

Mean annual precipitation ranges from 18 inches (45 cms) at lower elevations to 35 inches (88 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

The primary natural disturbance processes are fire and insects. Human-caused disturbances include timber harvesting and livestock grazing at lower elevations and recreation at higher elevations.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the uplands, and the meadows and flood plains.

The uplands are located on low to high elevation sites with dominant slope gradients from 5 to 40 percent. These landscapes include mountains and plateaus that have formed in basalt and andesite. The soil moisture regime is xeric. The soil temperature regime is dominantly frigid with cryic at higher elevations above about 6500 feet. The primary soils are deep and very deep to bedrock. The surface layer is typically a gravelly or cobbly loam with clay loam and cobbly clay loam subsoils. At the lower elevations ponderosa pine, squawcarpet, Idaho fescue and antelope bitterbrush dominate the potential natural vegetation. Pachic Argixerolls with intermittent grassland areas of Lithic Argixerolls dominate the landscape at the lower elevations. At the mid-elevations white fir, common snowberry and wheeler bluegrass dominate the potential natural vegetation. Pachic Ultic Argixerolls and Ultic Haploxerolls dominate the soils at the mid-elevations. At the higher elevations typically above 6500 feet, red fir, lodgepole pine, white fir, mountain brome and western princeps pine dominate the potential natural vegetation. Pachic Cryoborolls and Argic Pachic Cryoborolls dominate the soils at the high elevations.

The wet meadows and flood plains are located on low to high elevation sites. The dominant slope gradient is 0 to 1 percent. The soil moisture regime is aquic. The soil temperature regime is cryic with small areas at lowest elevation being frigid. The primary soils are very deep to bedrock and are poorly drained. The soils are frequently flooded and have seasonal high water tables in the spring. Aquandic Cryaquolls, Typic Cryaquands and Typic Cryaquolls dominate the landscape. The dominant potential natural vegetation consists of tufted hairgrass, meadow barley, redtop and mat muhley.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Joe

Bailey, U.S. Forest Service

M261Gc Modoc Pyroclastics, Forested

Location: This subsection is located in south-central Oregon and extends into northeastern California.

Subsection Concept: This subsection consists of forested uplands with intermingled open shrub-grassland areas and wet meadows and narrow flood plains. The uplands are underlain by tuff, while the meadows and flood plains consist of alluvium. This map unit is separated from adjacent subsections based upon parent material and landform. The adjacent Modoc Basalts, Forested subsection is underlain by basalt and andesite. The adjacent Lapine Pumice Flats subsection has a thick mantle of ash on the soil surface. The adjacent Klamath-Goose Lake Basin Floor and High Desert Lake Basins subsection have terraces and flood plains.

Subsection Setting and General Characteristics: These mountains and plateaus have an elevation range of 5000 to 8000 feet (1524 to 2438 meters). The dominant slope range is 0 to 40. The dominant type of rock is tuff.

Mean annual precipitation ranges from 18 inches (45 cms) at lower elevations to 35 inches (88 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

The primary natural disturbance processes are fire and insects. Human-caused disturbances include timber harvesting and livestock grazing at lower elevations and recreation at the higher elevations.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the uplands, and the meadows and flood plains.

The uplands are located on mid to high elevation sites with dominant slope gradients of 5 to 40 percent. These landscapes include mountains and plateaus that have formed in tuff. The soil moisture regime is xeric. The soil temperature regime is dominantly frigid with cryic at higher elevations above about 6500 feet. The primary soils are deep and very deep to bedrock. The surface layer is typically sandy loam with a cobbly or very gravelly sandy loam subsoil. At the mid-elevations, Typic Vitrixerands dominate the soils and ponderosa pine, white fir, common snowberry and heartleaf arnica dominate the potential natural vegetation. At the higher elevations above about 6500 feet (1981 meters) Xeric Vitricryands dominate the soils and white fir, western white pine, lodgepole pine and Wheeler bluegrass dominate the potential natural vegetation.

The wet meadows and flood plains are located on mid to high elevation sites. The dominant slope range is 0 to 1 percent. The soil moisture regime is aquatic. The soil temperature regime is cryic. The primary soils are very deep to bedrock and are poorly drained. The soils are frequently flooded and have seasonal high water tables in the spring. Aquandic Cryaquolls, Typic Cryaquands and Typic Cryaquolls dominate the soils on this landscape. The dominant potential natural vegetation consists of tufted hairgrass, meadow barley and mat muhley.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M261Gd Klamath Basin, Grasslands

Location: This subsection is located southcentral Oregon and northeastern California.

Subsection Concept: This subsection consists of uplands in the Klamath Basin which are underlain by basalt and andesite. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon landform and vegetation. The adjacent Modac Basalts, Forested and Modac Pyroclastics, Forested subsections are forested. The adjacent Klamath-Goose Lake Basin Floor subsection has terraces and flood plain landforms.

Subsection Setting and General Characteristics: These uplands consist of rolling hills that have an elevation range of 4000 to 5500 feet (1219 to 1676 meters). The dominant slope range is 2 to 35. The dominant type of rock is basalt and andesite. The primary geomorphic processes in these landscapes is reworking by alluvial and fluvial agents. The landforms are fairly mature with sheet and rill erosion dominating.

Mean annual precipitation ranges from 12 inches (30 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is mainly in the form of snow with spring and fall rains and occasional summer thunderstorms. The mean annual air temperature is 45 to 50 degrees F (7 to 10 degrees C).

The primary natural disturbance process is fire. Human-caused disturbances are mainly livestock grazing with irrigated agriculture in the included basins and valleys.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the rolling hills with small closed basins and narrow flood plains.

The rolling hills are located on mid-elevation sites with dominant slope gradients of 2 to 35 percent. These landscapes include the hills and associated drainage ways that have formed in basalt and andesite. The soil moisture regime is xeric and the soil temperature regime is mesic. The primary soils are moderately deep and shallow to bedrock. The surface layer is typically very stony loam with a very cobbly clay or clay loam subsoil. Lithic Argixerolls and Typic Argixerolls with minor amounts of Lithic Haploxerolls dominate the landscape. The dominant potential natural vegetation types are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, antelope bitterbrush, Wyoming sagebrush and western juniper.

The basins and flood plains have slopes of 0 to 1 percent. The primary soils in the basins and floodplains are very deep, poorly drained and frequently flooded and ponded. Fluvaquentic Endoaquolls and Xeric Endoaquerts dominate the landscape. The dominant potential natural vegetation consists of nuttall alkaligrass, baltic rush, willow and sedge.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Joe Bailey, U.S. Forest Service

M331Aa Island Park Caldera

Location: This subsection is located in the Upper Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection consists of a caldera and associated flow layers of extrusive volcanic materials. The major general vegetative types include Douglas-fir forest. This map unit is separated from similar subsections based upon lithology, geologic structure and topography. This large caldera landform is unique from other subsections. Parent material consists of weathered rock overlaid by loess.

Subsection Setting and General Characteristics: This caldera and associated flow layers has an elevation range of 5700 to 7000 feet/1750 to 2150 meters. The dominant slope range is 0 to 50 percent. The dominant types of rocks are rhyolite and basalt. The primary geomorphic processes in these landscapes are eolian. Weakly expressed fluvial systems are present.

Mean annual precipitation ranges from 20 inches/51 cms on the west side of the unit to 28 inches/71 cms on the east side of the unit. Precipitation is uniformly distributed throughout the year with 55 percent of the precipitation falling as snow. The mean annual air temperature is 38 to 42 degrees F/3 to 6 degrees C.

Streams typically occur in valleys. The landscape is slightly dissected.

The primary natural disturbance processes are fire, insects, disease, and windthrow. Human-caused disturbances include heavily used recreation area with Island Park Reservoir and Henry's Fork of Snake the main attractions. Many sanitation and salvage cuts in lodgepole pine. Most of the extensive private land here has been developed for summer homes.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include the floor of the caldera and the rim of the caldera.

The caldera floor is located on mid elevation sites with dominant slope gradients from 0 to 35 percent. These landscapes include ridges, sideslopes, and swales of volcanic flows that are formed in basalt and rhyolite that has been covered by loess. The primary soils are very deep with minor amounts of moderately deep and shallow soils. Texture of the very deep soil is silt loam with clay loam subsurface textures. These soils are classified as Typic Paleboralfs, Typic Cryumbrepts, and Lithic Cryoborolls. The dominant potential natural vegetation is subalpine fir/pinegrass h.t., pinegrass phase. Present vegetation commonly supported includes communities dominated by elk sedge or nonnative grasses in clearcut and scarified areas; lodgepole pine/elk sedge c.t.; lodgepole pine/pinegrass c.t. and communities dominated by lodgepole pine and nonnative grasses are supported in plantations.

The caldera rim is located on mid elevation sites with dominant slope gradients from 25 to 50 percent. These landscapes include foothills, mountains, and escarpments of plateaus that are formed in local alluvium or colluvium derived from mixed volcanic rocks and loess. The primary soils are very deep with gravelly silt loam surface textures and extremely cobbly sandy loam subsurface textures. These soils are classified as Typic Cryoborolls and Pachic Cryoborolls. The dominant potential natural vegetation is Douglas-fir/common snowberry h.t. Present vegetation commonly supported includes Douglas-fir/common snowberry h.t.; quaking aspen/Douglas-fir/Saskatoon serviceberry c.t.; quaking aspen/Saskatoon serviceberry/mountain snowberry/pinegrass c.t. and communities dominated by snowbrush ceanothus.

Compiled By: Targhee National Forest; Terry Bowerman and Terry Craig

M331Ab Pitchstone Plateau

Location: This subsection is located in the Upper Snake River Basin of southeastern Idaho and northwestern Wyoming.

Subsection Concept: This subsection consists of a plateau consisting of multiple layers of volcanic rocks that have been modified by fluvial erosion, with glaciation in the southern part. The major general vegetative types include Douglas-fir forest and western spruce-fir forest. This map unit is separated from similar subsections based upon lithology and parent material. Bedrock lithology consists of tephra. Parent material consists of mixed volcanic ash, loess and tephra.

Subsection Setting and General Characteristics: These plateaus have an elevation range of 6000 to 8200 feet/1800 to 2500 meters. The dominant slope range is mostly 2 to 25 percent with up to 80 percent on the drainageway sideslopes. The dominant types of rocks are tephra which includes ignimbrite, pumice and ash-flow tuff. The primary geomorphic processes in these landscapes are fluvial and colluvial with glacial process in the southern part of the subsection.

Mean annual precipitation ranges from 32 inches/80 cms at lower elevations to 60 inches/150 cms at the highest elevations. Precipitation is uniformly distributed throughout the year with 55 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 38 degrees F/-1 to 3 degrees C.

Streams are intermittent and very widely spaced in the northern part. Rivers and streams are more abundant in the southern portion of the subsection. The landscape is slightly dissected. Wetlands and lakes in the southern portion of the unit are associated with kettles.

The primary natural disturbance processes are fire, insects, disease, windthrow. Human-caused disturbances include sanitation and salvage cuts in lodgepole pine.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes plateaus.

The plateaus are located on high elevation sites with dominant slope gradients from 2 to 25 percent. These landscapes include sideslopes, swales and ridges of plateaus that are formed in local alluvium derived from loess and volcanic ash over residuum from mixed volcanic ash and tephra. The primary soils are very deep with silt loam surface textures and stratified gravelly coarse sand to extremely gravelly coarse sand subsurface textures. These soils are classified as Typic Vitricryands, Vitrandic Cryochrepts, and Humic Vitricryands. The dominant potential natural vegetation is subalpine fir/grouse blueberry h.t., grouse blueberry phase. Present vegetation commonly supported includes a lodgepole pine/grouse blueberry c.t. supported on lightly or nondisturbed areas; a lodgepole pine/elk sedge c.t. is supported on regenerating clearcuts and in plantations and a community dominated by elk sedge is supported in recent clearcut and scarified areas.

Compiled By: Targhee National Forest; Terry Bowerman and Terry Craig
Used map units 1570 and 1573

M331Ac Thoughfare Uplands

Location: This subsection is located mainly within the Missouri River Basin but two small portions on the southwestern side are within the Columbia River Basin. It is in the northwestern part of Wyoming, touching the southeastern corner of Yellowstone National Park.

Subsection Concept: This subsection consists of a moist mountain range with the South Fork of the Shoshone River Valley along the east side of the area. The valley portion is gently sloping colluvial materials. The mountains are formed in rocks of the Absaroka Volcanic Supergroup which are volcanic conglomerate and Tuff containing clasts of igneous rocks that have been modified by strongly faulted, frost-churning geomorphic processes. The South Fork Valley is made up of alluvial, colluvial, gravel, glacial, pediment and fan deposits that have been modified by both erosional and fluvial processes. The major general vegetative types include coniferous forest, grasslands and shrublands. This subsection is bordered on the north by andesitic volcanoclastic rocks. To the west and south by lands that are more gently sloping mountains. To the east the subsection is dominated by similar geologic types but has much more foothill type landscapes.

Subsection Setting and General Characteristics: This mountain range and valley have an elevation range of 6000 to 12,000 feet/1846 to 3692 meters. The slope range is 0 to 110 percent. The mountains are typically 45 to 75 percent and the valley portion is typically 10 to 35 percent. The dominant types of rocks are formed by volcanic activities and continues to be modified by colluvial, fluvial, faulting and frost churning processes. The primary geomorphic process in the valley is fluvial.

Mean annual precipitation ranges from 25 inches/64 cms in the valley bottom to 110 inches/280 cms on the highest peaks. Most precipitation occurs in the winter and spring with 65 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 65 degrees F/-4 to 18 degrees C.

This area is drained by three river systems. These are the Snake, Yellowstone and the Shoshone. This area is the headwaters for these streams. Wetlands are common in the flats of the Yellowstone floodplain. Several high mountain lakes occur in the upper reaches of the drainages.

The primary natural disturbance processes in the mountains are fire, insects, disease and mass failures. In the valley, flooding is the major disturbance factor. Human-caused disturbances include grazing, logging, mining and some urban development in the valley.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include the mountainous portion and the valley setting.

The mountainous areas are located on mid and high elevation sites with dominant slope gradients from 45 to 75 percent. These landscapes include steep to very steep mountain slope landforms that are formed in light-gray volcanic conglomerate and white tuff containing clasts of igneous rocks. This area has islands of dark-colored andesitic volcanoclastic rocks and flows underlain by light-colored andesitic tuffs and flows. The primary soils are moderately deep and deep, loams and silt loams. These soils are classified as Cryoboralfs, Cryoborolls, Lithic Cryoborolls, Cryochrepts, Cryumbrepts plus Rock outcrop. The dominant potential natural vegetation varies from grass and brushland to lodgepole or limber pine and some douglas fir in the wetter or cooler sites. The grass and brushland areas occur on the high energy slope because of the moisture stress and the low elevation sites that are moisture lacking.

The valley bottom is located on low elevation sites with dominant slope

gradients from 0 to 35 percent. The valley portion of the area is made up of clay, silt, sand and gravel in floodplains, fans and terraces. These landscapes include glacial deposits of till and outwash of sand, gravel and boulders. The primary soils are deep with loam, silt loam and clay loam textures. These soils are classified as Argiborolls and Torriorthents. The dominant potential natural vegetation is grassland and open grown timber types.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ad Absaroka Range

Location: This subsection is located in the Big Horn River Basin which is in the northwest corner of Wyoming.

Subsection Concept: This subsection consists of dry rolling foothills and steep to very steep mountains of the Absaroka Volcanic Supergroup which are andesitic conglomerates, sandstone and claystone rocks that have been modified by strongly faulted, frost-churned geomorphic processes. The major general vegetative types include coniferous forest in the mountain portion plus grasslands and shrublands in the foothills portion. This map unit is separated from similar subsections based upon geologic structure and parent material. This subsection is bordered on the north and south by broad basins and plains. To the East is the more gently rolling Owl Creek Subsection. To the west the subsection is dominated by similar geologic types but the area lacks the foothill type landforms.

Subsection Setting and General Characteristics: These foothills and high mountains have an elevation range of 6500 to 12,000 feet/2000 to 3692 meters. The dominant slope range is 35 to 65 percent. The dominant types of rocks are light-gray volcanic conglomerate and white tuff containing clasts of igneous rocks in the mountainous portion of the subsection. The foothill portion of the area is madeup of green and olive-drab hard generally well bedded andesitic conglomerate, sandstone and claystone. Additionally, there are portions of the foothills that are brightly variegated bentonitic claystone and tuffaceous sandstone, grading laterally into greenish-gray sandstone and claystone. The primary geomorphic processes in these landscapes are fluvial, residual, colluvial, faulting and frost churning.

Mean annual precipitation ranges from 20 inches/50 cms on the foothills portion to 100 inches/254 cms on the higher peaks. Most precipitation occurs in the winter and spring with approximately 60 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 65 degrees F/-7 to 18 degrees C. The number of frost free days range from 20 to 80 depending on the elevation and the cold air drainage.

This area is drained by the Wind River System. There are numerous tributaries, numerous reservoirs, a few high elevation lakes plus a few natural wetlands, floodplains and riparian zones. The landscape is highly dissected.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include extensive grazing, logging and mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include steep to very steep mountains and foothills.

The steep to very steep mountains are located on mid and high elevation sites with dominant slope gradients from 35 to 65 percent. These landscapes include mountain ridges, slopes and intermontane valley landforms that are formed in light-gray volcanic conglomerate and white tuff containing clasts of igneous rocks. The primary soils are moderately deep to deep with textures of loam and silt loam. These soils are classified as Cryoboralfs, Cryoborolls, Lithic Cryoborolls, Cryochrepts, Cryumbrepts plus Rock outcrop. This area has a cryic temperature regime. The moisture regimes is udic with some aquic areas in the drainageways, wetlands, floodplains and riparian zones. The dominant potential natural vegetation is lodgepole or limber pine and some douglas fir in the wetter or cooler sites. The grass and brushland areas occur on the high energy slope because of the moisture stress and the low elevation sites that are moisture lacking.

The foothills are located on low elevation sites with dominant slope gradients

from 15 to 45 percent). These landscapes include foothill and draw landforms that are formed in green and olive-drab hard generally well bedded andesitic conglomerate, sandstone and claystone. Additionally, there are portions of the foothills that are brightly variegated bentonitic claystone and tuffaceous sandstone, grading laterally into greenish-gray sandstone and claystone. These are deep, silt loam and clay loam soils. These soils are classified as Argiborolls and Torriorthents. The dominant potential natural vegetation is grass and shrubland with some douglas fir in the wetter draws.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ae Owl Creek Mountains

Location: This subsection is located in the Wind River Basin which is in the northwest portion of Wyoming.

Subsection Concept: This subsection consists of semi-dry, rolling to moderately steep mountains formed in rocks that include granite, massive siliceous dolomite and dull-red quartzitic sandstone. This area is an up-lift in the high desert that have been modified by colluvial, fluvial processes with some faulting. The major general vegetative types include coniferous forest at the higher elevations with grass and shrublands at the lower elevations and the high energy slopes. This map unit is separated from similar subsections on the north, south and east by high desert lands. The subsection to the west is made-up of steep mountains of the Absaroka Range, which are made-up of felsic and mafic igneous bodies plus, light-gray volcanic conglomerate and white tuff containing clasts of igneous rocks.

Subsection Setting and General Characteristics: This mountain range has been formed by area up-lift and volcanic intrusive activity which has an elevation range of 6000 to 10,000 feet (1846 to 3077 meters). The dominant slope range is 35 to 65 percent. The dominant types of rocks are granite, light-gray massive siliceous dolomite and dull-red quartzitic sandstone. The primary geomorphic processes in these landscapes are fluvial, residual and colluvial.

Mean annual precipitation ranges from 20 inches/50 cms at the low elevation sites to 50 inches/127 cms at the higher elevation sites. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 75 degrees F/-6 to 24 degrees C.

Streams typically occur in high mountain draws and drained in an easterly direction into the Wind River System. There are numerous tributaries, numerous reservoirs, several natural wetlands, floodplains and riparian zones. The landscape is moderately dissected. Wetlands occur in the draws and on floodplains associated with alluvial deposits.

The primary natural disturbance processes are fire, insects, disease, and flooding. Human-caused disturbances include ranching, grazing some logging and mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountains and foothills.

The Owl Mountains are located on mid elevation sites with dominant slope gradients from 45 to 75 percent. These landscapes include mountain slope and ridge landforms that are formed in granite, dolomite and sandstone parent materials. The primary soils are deep with loam and sandy loam textures. These soils are classified as Cryoboralfs, Cryoborolls and Rock outcrop. The dominant potential natural vegetation is lodgepole or limber pine with shrub or grasslands on the high energy slopes.

The foothills of the Owl Mountains are located on moderately low elevation sites with dominant slope gradients from 20 to 50 percent. These landscapes include rolling foothills, drainageways and floodplain landforms that are formed in granite, dolomite and sandstone parent materials. The primary soils are deep with silt loam and clay loam textures. These soils are classified as Cryoboralfs and Cryoborolls. The dominant potential natural vegetation is shrub or grasslands due to the low precipitation with lodgepole or limber pine in the wet draws.

Compiled by: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Af Yellowstone Plateau

Location: This subsection is located in the center of Yellowstone National Park. It is in the Yellowstone and Snake River Basins with a small portion in Montana and the rest in Wyoming.

Subsection Concept: This subsection consists of a moist, nearly level to rolling high elevation mountain plateau formed in rocks of the Yellowstone group which are rhyolite flows, tuff and intrusive igneous rocks that have been modified by strongly faulted, frost-churned high elevation lands. The major general vegetative types include lodgepole pine and some douglas fir in the cooler sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress. Additionally, there are numerous wetland meadows with grass/forb/shrub vegetation. This map unit is separated from surrounding subsections on all sides by steep to very steep mountains of varied parent material types.

Subsection Setting and General Characteristics: This volcanic plateau has an elevation range of 7500 to 9200 feet/2308 to 2831 meters. The dominant slope range is 5 to 30 percent. The dominant types of rocks are rhyolite and tuff with interlayered sediments of the Yellowstone group. Additionally, there are islands of undivided surficial deposits, mostly alluvial, colluvial, glacial and landslide deposits. The primary geomorphic processes in these landscapes are colluvial, fluvial, faulting and frost churning.

Mean annual precipitation ranges from 60 inches/152 cms at the lower elevations to 90 inches/229 cms at the highest elevations. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 55 degrees F/-6 to 13 degrees C.

This area drains in all directions because it straddles the continental divide. To the south and west it drains into the Snake River system and to the north and east it flows into the Yellowstone River system. The landscape is very flat with very slight dissection. There are numerous tributaries, floodplains and riparian zones caused by the geiser activity. There are many high elevation lakes plus many natural wetlands.

The primary natural disturbance processes are fire, insects, disease, geiser activity and mass failures. Human-caused disturbances include recreational development and tourist activities.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, which is the volcanic plateau.

The volcanic plateau is located on high elevation sites with dominant slope gradients from 5 to 30 percent. This landscape include typical flat to rolling landforms that are formed in rhyolite and tuff with interlayered sediments of the Yellowstone group. Additionally, there are islands of undivided surficial deposits, mostly alluvial, colluvial, glacial and landslide deposits. The primary soils are moderately deep to deep silt loam to clay. These soils are classified as Cryochrepts and Cryorthents. The dominant potential natural vegetation is lodgepole pine and some douglas fir in the cooler sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress. Additionally, there are numerous wetland meadows with grass/forb/shrub vegetation.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ag Northern Absaroka Range

Location: This subsection is located in the Bighorn River Basin in the northwestern corner of Wyoming.

Subsection Concept: This subsection consists of rolling to very steep mountain ridgetops and slopes with narrow valleys of Absaroka Volcanic Supergroup which are andesitic volcanoclastic rocks that have been modified by strongly faulted and frost-churned geomorphic processes. The major general vegetative types include coniferous forest with grass and shrublands on the high energy slopes and at the low elevations. This map unit is separated from surrounding subsections based upon the following factors. This subsection is bordered on the north and east by mountains of Pre-Belt chiefly layered granitic gneiss, locally migmatitic. To the south the subsection is generally made up of flows and tuffs of trachyandesite. The subsection to the west is gently sloping mostly alluvium, colluvium, glacial and landside deposits.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 5300 to 12,000 feet/1630 to 3692 meters. The dominant slope range is 25 to 90 percent. The dominant types of rocks are andesitic volcanoclastic of the Absaroka Volcanic Supergroup. Additionally, there are islands of dark-colored andesitic volcanoclastic rocks and flows underlain by light-colored andesitic tuffs and flows, plus, trachyandesite. The primary geomorphic processes in these landscapes are colluvial, fluvial, faulting and frost churning.

Mean annual precipitation ranges from 40 inches/102 cms at the Buffalo Bill Reservoir to 110 inches/279 cms at the highest elevations. Most precipitation occurs in the winter and spring seasons with 65 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 65 degrees F/-4 to 18 degrees C.

This area is drained partially to the north into the Yellowstone River and partially to the east into the Big Horn River. There are numerous tributaries, numerous reservoirs, a few high elevation lakes plus many natural wetlands, floodplains and riparian zones. The landscape is highly dissected. Wetlands occur in the narrow canyons associated with alluvial deposits. Lakes occur in high elevation cirques.

The primary natural disturbance processes are fire, insects, disease and mass failures. Human-caused disturbances include recreational development adjacent to Yellowstone Park. Some logging and mining activities are occurring.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include the steep mountain area and the valley/foothill area of the Shoshone River.

The steep mountain area is located on mid and high elevation sites with dominant slope gradients from 45 to 90 percent. These landscapes include steep mountain slopes and ridgetop landforms that are formed in andesitic volcanoclastic parent materials. The primary soils are moderately deep and deep with loam and silt loam textures. These soils are classified as Cryoboralfs, Cryoborolls, Lithic Cryoborolls, Cryochrepts plus Rock outcrop and talus. The dominant potential natural vegetation is lodgepole pine and some Douglas fir in the wetter or cooler sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress. There are numerous wetland meadows with grass/forb/shrub vegetation.

The valley/foothill area is located on low elevation sites with dominant slope gradients from 5 to 35 percent. These landscapes include terrace, bench, floodplain and foothill landforms that are formed in colluvial and alluvial materials from andesitic volcanoclastic rocks. The primary soils are deep with

textures of loam, silt loam and clay loam. These soils are classified as Cryoborolls and Cryochrepts. The dominant potential natural vegetation is lodgepole pine. Grassy or brushy slopes occur on the high energy slope because of the moisture stress. There are numerous wetland meadows with grass/forb/shrub vegetation.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ah Beartooth Mountains

Location: This subsection is located mainly in the Big Horn River Basin of the northwestern portion of Wyoming and southern Montana.

Subsection Concept: This subsection consists of very steep dissected mountains and narrow valleys of Pre-Belt gneiss, schist and related rocks that have been modified by strongly faulted and frost-churning geomorphic processes. The major general vegetative types include coniferous forest plus grass and shrublands. This subsection is bordered on the north and east by foothills and basins. To the south and west the subsection is generally made up of Tertiary volcanic rocks, mainly flows and associated pyroclastic deposits of latite, quartz latite and andesitic materials.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 6500 to 11,300 feet/2000 to 3477 meters. The dominant slope range is 45 to 110 percent. The dominant types of rocks are Pre-Belt gneiss, schist and related rocks which include interlaminated gneiss, schist, marble and quartzite. The gneiss and schist can be of both sedimentary and igneous origin. The primary geomorphic processes in these landscapes are colluvial, fluvial, faulting and frost churning. Some local glacial activity occurs at the higher elevations.

Mean annual precipitation ranges from 40 inches/102 cms in the lower valleys to 110 inches/279 cms at the highest mountain peaks. Most precipitation occurs in the winter and spring seasons with 55 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 55 degrees F/-6 to 13 degrees C.

This area drains north into the Yellowstone River and east into the Big Horn river. There are numerous small tributaries, reservoirs, a few high elevation lakes plus natural wetlands, floodplains and riparian zones in the drainageways. The landscape is highly dissected.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is the very steep dissected mountains and narrow valley landscapes.

The steep dissected mountains are located on mid to high elevation sites with dominant slope gradients from 45 to 110 percent. These landscapes include steep mountain slope and ridgetop landforms that are formed in Pre-Belt gneiss, schist and related rocks which include interlaminated gneiss, schist, marble and quartzite. The primary soils are shallow to moderately deep with textures of loam, silt loam and silty clay loam. These soils are classified as Cryochrepts plus Rock outcrop and talus. The dominant potential natural vegetation is lodgepole pine and some douglas fir in the wetter or cooler sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ai Beartooth Foothills

Location: This subsection is located in the Yellowstone River Basin of Montana and the Big Horn River Basin of Wyoming.

Subsection Concept: This subsection consists of moderately dry, moderately rolling to steep dissected foothills formed in Pre-Belt gneiss, schist and related rocks with islands of Cretaceous volcanic rocks that have been modified by colluvial and fluvial geomorphic processes. The major general vegetative types include grass and shrublands. This map unit is separated from similar subsections on the south and west by high, steep mountain ranges. To the north and east the subsections are generally made up of basin and plain landscapes.

Subsection Setting and General Characteristics: These foothills have an elevation range of 5000 to 11,300 feet/1538 to 3477 meters. The dominant slope range is 15 to 90 percent. The dominant types of rocks are Pre-Belt gneiss, schist and related rocks with an island of Cretaceous volcanic flows and pyroclastic rocks, mainly of intermediate composition with subordinate amount of interbedded sedimentary rocks. The primary geomorphic processes in these landscapes are colluvial and fluvial.

Mean annual precipitation ranges from 20 inches/51 cms at the lowest elevations to 50 inches/127 cms at the highest elevations. Most precipitation occurs in the winter and spring seasons with 45 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 65 degrees F/-1 to 18 degrees C.

This area drains north into the Yellowstone River and east into the Big Horn River. There are numerous small tributaries, some small reservoirs, natural wetlands and floodplains in the drainageways. Streams occur on the lowest landscape settings. The landscape is highly dissected. Wetlands occur in the drainageways associated with fluvial deposits.

The primary natural disturbance processes are fire, insects, disease, and local flooding. Human-caused disturbances include agriculture, grazing, logging and mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is the moderately rolling to steep dissected foothill landscape.

The moderately rolling to steep dissected foothills are located on low to mid elevation sites with dominant slope gradients from 15 to 60 percent. These landscapes include moderately rolling to steep dissected foothill that are formed in Pre-Belt gneiss, schist and related rocks with islands of Cretaceous volcanic rocks plus draw and floodplain landforms that are formed in colluvial and fluvial parent materials. The primary soils are moderately deep to deep with textures of silt loam, clay loam and silty clay loam. These soils are classified as Argiborolls, Lithic Haploborolls, Haploborolls, Cryoborolls, Cryochrepts and Ustochrepts. The dominant potential natural vegetation is shrub or grassland.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Aj Mammoth Highlands

Location: This subsection is located in the Yellowstone River Basin with part in the northwest corner of Yellowstone Park in Wyoming and part in the Montana north of the Park.

Subsection Concept: This subsection consists of moist, steep to very steep dissected mountains formed in Tertiary volcanic rocks with islands of Pre-Belt gneiss, schist and related rocks that have been modified by strongly faulting and frost-churning geomorphic processes. The major general vegetative types include coniferous forest with grass and shrublands on the high energy slopes. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. This subsection is bordered on the west by a mountain range of sedimentary rocks. To the north and east the subsections are generally made up of all Pre-Belt gneiss, schist and related rocks. The subsection to the south, which is in Yellowstone Park, is made up of more gently rolling topography with mixed bedrock types but, typically, volcanic dominated.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 6500 to 10,600 feet/2000 to 3262 meters. The dominant slope range is 35 to 110 percent. The dominant types of rocks are Tertiary volcanic flows and associated pyroclastic deposits. They include latite, quartz latite and andesite but includes some rhyolite and basalt. The primary geomorphic processes in these landscapes are colluvial, fluvial, faulting and frost churning.

Mean annual precipitation ranges from 50 inches/127 cms at the lower elevations to 110 inches/279 cms at the higher peaks. Most precipitation occurs in the winter and spring seasons with 65 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 55 degrees F/-7 to 13 degrees C.

This area drains, mainly north into the Yellowstone River but a small portion does flow west into the Gallatin River. There are numerous small tributaries, some high mountain lakes, plus natural wetlands and floodplains in the drainageways. The streams occur on low topographic settings. The landscape is moderately dissected. Wetlands occur in the drainageways associated with fluvial deposits. Lakes occur in high elevation cirques.

The primary natural disturbance processes are fire, insects, disease and mass failures. Human-caused disturbances include recreational development, logging, mining and minor amounts of grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is a mountain range.

The mountain range is located on mid to high elevation sites with dominant slope gradients from 35 to 110 percent. This landscape includes mountain slope, ridgetop and narrow valley landforms that are formed in Tertiary volcanic rocks with islands of Pre-Belt gneiss, schist and related rocks. The primary soils are shallow to deep with textures of silt loam, clay loam and silty clay loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoborolls, Cryoborolls, Cryochrepts plus Rock outcrop and talus. The dominant potential natural vegetation is typically lodgepole pine and some douglas fir occurs in the wetter sites. Grassy or brushy slopes occur on the high energy slopes and the low elevation sites because of the moisture stress.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ak West Yellowstone Valley

Location: This subsection is located in the Madison River Basin of the northwestern corner of Wyoming and southern Montana. It is mainly within Yellowstone Park.

Subsection Concept: This subsection consists of a high elevation mountain valley formed by the Madison River in mainly valley fill consisting of silt, sand and gravel but including some terrace deposits and glacial drift that have been modified by colluvial and fluvial geomorphic processes. The major general vegetative types include coniferous forest with marsh and wetlands. This map unit is separated from similar subsections based upon geologic structure. This subsection is bordered on all sides by mountain ranges.

Subsection Setting and General Characteristics: This high mountain valley have an elevation range of 6500 to 7000 feet/2000 to 2154 meters. The dominant slope range is 0 to 40 percent. The dominant types of parent material are valley fill consisting of silt, sand and gravel but including some terrace, deposits and glacial drift. The primary geomorphic processes in these landscapes are colluvial and fluvial.

Mean annual precipitation ranges from 45 inches/114 cms to 55 inches/140 cms depending on the year. Most precipitation occurs in the winter and spring seasons with 45 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 65 degrees F/-4 to 18 degrees C.

This area is drained by the Madison River. Hebgen Lake is within this subsection on the valley floor. Additionally, there are numerous small tributaries, a few reservoirs, natural wetlands and floodplains in the drainageways and depressions.

The primary natural disturbance processes are (fire and flooding. Human-caused disturbances include recreational development, some logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is a high elevation mountain valley formed by the Madison River in mainly valley fill.

The mountain valley is located on mid elevation sites with dominant slope gradients from 0 to 40 percent. These landscapes include bench, terrace and floodplain landforms that are formed in valley fill consisting of silt, sand and gravel but including some terrace deposits and glacial drift. The primary soils are deep with textures of loam and sandy loam. These soils are classified as Cryochrepts and Cryorthents. The dominant potential natural vegetation is grass or brushland with scattered limber or lodgepole pine in draws and cottonwoods in wetter areas.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331A1 Upper Yellowstone Valley

Location: This subsection is located in the Yellowstone River Basin of southern Montana.

Subsection Concept: This subsection consists of the Yellowstone Valley bottom, benches, toeslopes and foothills of Tertiary rocks that have been modified by fluvial geomorphic processes. The major general vegetative types include grass and shrublands. This map unit is separated from similar subsections based upon geologic structure and parent materials. This subsection is surrounded by subsections on the west, south and east that are mountain ranges. To the North the subsection is made up of water-laid volcanic material, mainly andesitic in composition.

Subsection Setting and General Characteristics: This valley has an elevation range of 4500 to 7500 feet/1385 to 2308 meters. The dominant slope range is 0 to 50 percent. The dominant types of rocks are Tertiary sedimentary and volcanic rocks. Typically, the alluvial materials are poorly consolidated gravels, sands, silts and clays. The remainder of the area are flows and pyroclastic deposits with subordinate amounts of intercalated sedimentary beds and lignite. The volcanic material is mostly latite, quartz latite and andesite but includes some rhyolite and basalt. The primary geomorphic process in this landscape is fluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the northern extreme of the unit to 40 inches/102 cms at the southern extreme. Most precipitation occurs in the winter and spring seasons with 55 percent of the precipitation falling as snow. The mean annual air temperature is 18 to 55 degrees F/-8 to 13 degrees C.

The Yellowstone River runs the length of the subsection. There are numerous small tributaries, reservoirs and natural wetlands in the valley floor. The landscape is slightly highly dissected.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include recreational development, some logging, mining, agriculture and grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is the Yellowstone River Valley.

The Yellowstone River Valley is located on low elevation sites with dominant slope gradients from 0 to 50 percent. These landscapes include valley bottom, bench, toeslope and foothill landforms that are formed in Tertiary sedimentary and volcanic rocks or the alluvial materials are poorly consolidated gravels, sands, silts and clays. The remainder of the area are flows and pyroclastic deposits with subordinate amounts of intercalated sedimentary beds and lignite. The volcanic material is mostly latite, quartz latite and andesite but includes some rhyolite and basalt parent materials. The primary soils are deep with textures that are loam, silt loam and clay loam. These soils are classified as Argiborolls, Haploborolls, Lithic Haploborolls, Cryoborolls, Cryochrepts, Camborthids and Rock outcrops. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and at the higher elevations.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Am Mount Ellis

Location: This subsection is located in the partially in the Gallatin and partially in the Yellowstone River Basins of Montana.

Subsection Concept: This subsection consists of steep, dissected mountains formed in various groups and types of sandstones, shales, limestones, dolomites, quartzites, mudstones and calcareous shales that have been modified by colluvial, fluvial and faulting geomorphic processes. The major general vegetative types include coniferous forest with grass and shrublands on the high energy slopes or at low elevations. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. This subsection is bordered to the north and east by units that are typically basins. To the West the subsection is generally made up of Pre-Belt gneiss, schist and related rocks. To the south the unit is made up of Tertiary volcanic rocks, mainly latite, quartz latite and andesitic.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 5000 to 8300 feet/1538 to 2554 meters. The dominant slope range is 45 to 110 percent. The dominant types of rocks are sedimentary in nature and greatly varied. They include sandstones, shales, limestones, dolomites, quartzites, mudstones and calcareous shales of various formations and groups. The primary geomorphic processes in these landscapes are colluvial, fluvial and faulting.

Mean annual precipitation ranges from 40 inches/102 cms at the lower elevations to 80 inches/203 cms at the higher elevations. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 18 to 60 degrees F/-8 to 16 degrees C.

This area mainly drains westward to the Gallatin Valley but a portion of the area drains to the northeast down the Yellowstone. There are numerous small tributaries, reservoirs plus natural wetlands and floodplains in the drainageways. The landscape is highly dissected.

The primary natural disturbance processes are fire, insects, disease and some mass failures. Human-caused disturbances include logging, mining and some grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is a mountain range.

The mountain range is located on mid elevation sites with dominant slope gradients from 45 to 110 percent. These landscapes include mountain slope, ridgetop and narrow valley landforms that are formed in rocks which are sedimentary in nature and greatly varied. They include sandstones, shales, limestones, dolomites, quartzites, mudstones and calcareous shales of various formations and groups. The primary soils are shallow to deep with textures of loam, sandy loam and silt loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoborolls and Cryochrepts. The dominant potential natural vegetation is typically limber or lodgepole pine and douglas fir in the wetter sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331An Spanish Breaks

Location: This subsection is located in Montana between the Madison and Gallatin Rivers which drain into the Missouri River.

Subsection Concept: This subsection consists of dry, rolling to moderately steep foothills and low mountains formed in Pre-Belt gneiss, schist and related rocks that have been modified by colluvial and fluvial geomorphic processes. The major general vegetative types include grass and shrublands with conifers in the draws and wet areas. This map unit is separated from similar subsections based upon geologic structure, climatic/vegetative or parent material factors. This subsection is bordered to the north and west by a major basin. To the east the subsection is generally made up of very steep sedimentary rocks. To the south the unit is made up of dissected very steep mountain slopes of similar rock types.

Subsection Setting and General Characteristics: These rolling to moderately steep foothills and low mountains have an elevation range of 5000 to 6500 feet/1538 to 2000 meters. The dominant slope range is 25 to 75 percent. The dominant types of rocks are Pre-Belt gneiss, schist and related rocks with a small portion of sedimentary rocks which are mainly, sandstones, shales, limestones and calcareous shales of various formations and groups. The primary geomorphic processes in these landscapes are colluvial and fluvial.

Mean annual precipitation ranges from 20 inches/51 cms in the lower foothills to 40 inches/102 cms in the mountain portion. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 65 degrees F/-4 to 18 degrees C.

This area drains northward into the Gallatin Valley and is drained by the Madison and Gallatin Rivers. This area is part of the headwaters of the Missouri River. The landscape is moderately dissected. There are numerous small tributaries, reservoirs plus natural wetlands and floodplains in these major drainageways.

The primary natural disturbance processes are fire and flooding. Human-caused disturbances include ranching, farming, grazing and minor amounts of logging.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include rolling to moderately steep foothills and low mountains.

The rolling to moderately steep foothills are located on low elevation sites with dominant slope gradients from 25 to 45 percent. These landscapes include draw, narrow valley and foothill landforms that are formed in Pre-Belt gneiss, schist and related rocks with a small portion of sedimentary rocks which are mainly, sandstones, shales, limestones and calcareous shales of various formations and groups. The primary soils are deep with textures of loam, silt loam and clay loam. These soils are classified as Argiborolls, Haploborolls and Fluvaquents. The dominant potential natural vegetation is The potential natural vegetation is typically grass or brushland with some timber in the draws and wetter areas. These timber types are typically, douglas fir.

The low mountains are located on mid elevation sites with dominant slope gradients from 45 to 75 percent. These landscapes include mountain slopes, ridgetops and narrow valleys landforms that are formed in Pre-Belt gneiss, schist and related rocks with a small portion of sedimentary rocks which are mainly, sandstones, shales, limestones and calcareous shales of various formations and groups. The primary soils are shallow to moderately deep with textures of loam, silt loam and clay loam. These soils are classified as Cryoborolls, Cryochrepts and Rock outcrop. The dominant potential natural vegetation is The potential natural vegetation is typically grass or brushland

with some timber in the draws and wetter areas. These timber types are typically, douglas fir.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ao Spanish Peaks

Location: This subsection is located between the Madison and Gallatin Rivers which are in the Missouri River Basin of southern Montana.

Subsection Concept: This subsection consists of highly dissected mountains formed in Pre-Belt gneiss, schist and related rocks that have been modified by strong faulting, frost-churning geomorphic processes. The major general vegetative types include coniferous forest with some grass and shrublands. This map unit is separated from similar subsections based upon geologic structure and parent material. The subsections to the south and east are made up of more rolling topography with mixed bedrock types. The subsection to the north is foothill type landforms and the one to the west is a major valley.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 7500 to 10,500 feet/2308 to 3231 meters. The dominant slope range is 45 to 110 percent. The dominant types of rocks are sedimentary and metamorphosed sedimentary with a great deal of variety. They include sandstones, shales, limestones, mudstones and conglomerates of various formations and groups. Additionally, there are some major inclusions of diorite and gabbro rocks. The primary geomorphic processes in these landscapes are residual influenced by strong faulting, frost-churning and fluvial.

Mean annual precipitation ranges from 50 inches/127 cms at the lower elevations to 100 inches/254 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 65 percent of the precipitation falling as snow. The mean annual air temperature is 15 to 55 degrees F/-9 to 13 degrees C.

This area drains west into the Madison River and east into the Gallatin River. Both rivers are part of the Missouri River Basin. The landscape is highly dissected. There are numerous small tributaries, a few reservoirs, natural wetlands and floodplains in the drainageways.

The primary natural disturbance processes are fire, insects, disease and some mass failures problems. Human-caused disturbances include logging and mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is a highly dissected mountain range.

The mountain range are located on high elevation sites with dominant slope gradients from 45 to 110 percent. These landscapes include mountain slope, ridgetop and narrow valley landforms that are formed in sedimentary and metamorphosed sedimentary with a great deal of variety. They include sandstones, shales, limestones, mudstones and conglomerates of various formations and groups. Additionally, there are some major inclusions of diorite and gabbro rocks. The primary soils are shallow to moderately deep with textures of loam and sandy loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoboralfs, Cryochrepts plus Rock outcrop and talus. The dominant potential natural vegetation is typically lodgepole pine and some douglas fir in the wetter sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Ap Lincoln Mountain

Location: This subsection is located between the Madison and Gallatin Rivers and flows into each. It is part of the Missouri River Basin in south central Montana.

Subsection Concept: This subsection consists of moist, steep mountains formed in diverse variety of geologic formations, groups and types of bedrocks that have been modified by strongly faulting and frost-churning geomorphic processes. The major general vegetative types include coniferous forest plus grass and shrublands in the high energy sites. This map unit is separated from similar subsections based upon geologic structure and parent material. It is bordered on the west and on the north by dissected very steep mountains of older age rocks. To the east the subsection is generally made up of Tertiary volcanic rocks, mainly flows and associated pyroclastic deposits of latite, quartz latite and andesitic materials. The subsection to the south is made up of gentler topography of gravelly alluvium.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 7500 to 11,200 feet/2308 to 3446 meters. The dominant slope range is 45 to 110 percent. The dominant types of rocks are sedimentary with several intrusions of volcanic rocks. They include sandstones, shales, limestones, mudstones, siltstones, calcareous shales and conglomerates of various formations and groups. The major inclusions are flows and pyroclastic rocks plus diorite and gabbro rocks. The primary geomorphic processes in these landscapes are colluvial, fluvial, faulting and frost-churning.

Mean annual precipitation ranges from 50 inches/127 cms at the lower elevations to 100 inches/254 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 65 percent of the precipitation falling as snow. The mean annual air temperature is 15 to 55 degrees F/-9 to 13 degrees C.

This area drains west into the Madison River and east into the Gallatin River. Streams typically occur in narrow valleys. The landscape is moderately dissected. There are numerous small tributaries, a few reservoirs, natural wetlands and floodplains in the drainageways. Lakes occur in high elevation cirque basins.

The primary natural disturbance processes are fire, insects, disease and some minor amounts of mass failures. Human-caused disturbances include logging, mining and small amounts of grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. It includes moist, steep mountains.

The moist, steep mountains are located on high elevation sites with dominant slope gradients from 45 to 110 percent. These landscapes include mountain sideslope, ridgetop and narrow valley landforms that are formed in rocks are sedimentary with several intrusions of volcanic rocks. They include sandstones, shales, limestones, mudstones, siltstones, calcareous shales and conglomerates of various formations and groups. The major inclusions are flows and pyroclastic rocks plus diorite and gabbro rocks. The primary soils are shallow to moderately deep with textures of silt loam, clay loam and silty clay loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoboralfs, Cryochrepts plus Rock outcrop and talus. The dominant potential natural vegetation is typically lodgepole pine and some douglas fir in the wetter sites. Grassy or brushy slopes occur on the high energy slope because of the moisture stress.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M331Da Upper Cache Valley

Location: This subsection is located in the Bear and Portneuf River Basins in Idaho and Utah.

Subsection Concept: This subsection consists of broad open valleys and foothills of alluvium from Lake Bonneville that have been modified by fluvial processes. The major general vegetative types include grasslands and shrublands. This map unit is separated from similar subsections based upon lacustrine deposits, differences in vegetation and drier climate from surrounding and adjacent subsections.

Subsection Setting and General Characteristics: These lake deposits from Lake Bonneville have an elevation range of 4,600 to 5,800 feet/1,400 to 1,750 meters. The dominant slope range is 5 to 30 percent. The dominant types of rocks are unconsolidated gravel and sand, conglomerate, sandstone, claystone and siltstone. The primary geomorphic processes in these landscapes are fluvial, residual, and depositional.

Mean annual precipitation ranges from 15 inches/30.5 cms at lowest elevations to 20 inches/51 cms at highest elevations in the subsection. Most precipitation occurs in the winter months with 45 percent of the precipitation falling as snow. The mean annual air temperature is 37 to 45 degrees F/2.8 to 7.2 degrees C.

Streams and rivers typically occur through the lowest portions of the subsection. The landscape is moderately dissected. Wetlands occur in the Marsh Valley associated with alluvial deposits.

The primary natural disturbance processes are flooding and mass failures. Human-caused disturbances include agricultural related activities such as farming and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include open valleys and foothills.

The open valleys are located on low elevation sites with dominant slope gradients from 5 to 15 percent. These landscapes include stream terraces, bottomlands and undulating hills that are formed in stream alluvium and lake deposits. The primary soils are deep and well to somewhat poorly drained. They are generally fine textured. These soils are classified as Fluventic and Cumulic Haploxerolls. The dominant potential natural vegetation is riparian/wetlands vegetation in the bottoms and basin big sagebrush on the hills and terraces.

The foothills are located on the east and west edges of the subsection on the higher elevations with dominant slope gradients from 10 to 30 percent. These landscapes include rolling hills and foothills of mountains that are formed from residuum and colluvium with some surficial lake deposits. The primary soils are deep and well drained. They are generally moderate textured. These soils are classified as Calcic Argixerolls, Calcic Haploxerolls and Argic Durixerolls. The dominant potential natural vegetation is Wyoming sagebrush, mountain big sagebrush and bluebunch wheatgrass and indian ricegrass.

Compiled By: Caribou National Forest

M331Db Portneuf Uplands

Location: This subsection is located in the Portneuf River drainage of southeast Idaho.

Subsection Concept: This subsection consists of high mountains together with narrow valleys and steep foothills formed from limestone, dolomite and quartzite that have been modified by pluvial, colluvial and fluvial geomorphic processes with some mass movement. The major general vegetative types include coniferous forest and shrublands. This subsection separated from similar subsections based upon mountains and ranges that represent similar features to the Basin and Range geomorphology and forest vegetation types. A wetter and colder climate influence on the mountainous geomorphology is the primary differentiating criteria.

Subsection Setting and General Characteristics: These mountains and valleys have an elevation range of 4,500 to 9,271 feet / 1,370 to 2,825 meters. The dominant slope range is 30 to 70 percent. The dominant types of rocks are limestone, dolomite, chert, sandstone, mudstone, siltstone and quartzite. The primary geomorphic processes in these landscapes are colluvial, residual and fluvial.

Mean annual precipitation ranges from 18 inches/46 cms in the lowest elevations to 35 inches/89 cms at the tops of the mountains. Differences are due to elevational differences and rain shadow effect. Most precipitation occurs in the winter months with 44 percent of the precipitation falling as snow. The mean annual air temperature is 37 to 45 degrees F/2.8-7.2 degrees C.

Streams typically occur on narrow valleys. The landscape is moderately dissected. Isolated areas of wetlands occur in the valleys along streams associated with alluvial deposits.

The primary natural disturbance processes are fire, insects, disease, windthrow and mass failures. Human-caused disturbances include timber harvest, recreation activities and grazing activities.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountains and valleys.

The mountains are located on mid to high elevation sites with dominant slope gradients from 30 to 70 percent. These landscapes include ridges, steep mountain sideslope landforms that are formed in sedimentary materials from the Paleozoic Era. The primary soils are shallow to deep and well drained. Surface soils are generally loamy to silty textures. These soils are classified as Argic Cryoborolls, Cryic Paleborolls, and Typic Cryoborolls often associated with conifer forest vegetation and Pachic Cryoborolls associated with aspen and sagebrush-grass vegetation. The dominant potential natural vegetation is Douglas-fir forest and Mountain Big sagebrush.

The narrow valleys are located at the lower elevation sites with dominant slope gradient from 5 to 30 percent. These landscapes include bottomlands and stream terrace landforms that are formed in alluvial materials. The primary soils are deep to very deep and somewhat poorly drained. Surface soils are generally gravelly loam and gravelly sandy loam textures. These soils are classified as Fluventic Cryoborolls and Cumulic Cryoborolls. The dominant potential natural vegetation is willow-sedge community types.

Compiled By: Caribou National Forest

M331Dc Cache Front

Location: This subsection is located in the Bear River basin of southeast corner of Idaho.

Subsection Concept: This subsection consists of west face of the Bear River Mountain Range consisting of very steep mountains of limestone, dolomite and quartzite that have been modified by Karst solution, periglaciation, fluvial, colluvial and glaciation. The major general vegetative types include coniferous forest and shrublands. This map unit is separated from similar subsections based upon block faulting and climatic differences that support forest type vegetation.

Subsection Setting and General Characteristics: These block faulted and uplifted mountains have an elevation range of 5,000 to 10,000 feet / 1,525 to 3,050 meters. The dominant slope range is 50 to 90 percent. The dominant types of rocks are limestone, dolomite, sandstone, mudstone, tuffaceous sediments and quartzite from the Paleozoic Era. The primary geomorphic processes in these landscapes are glacial, fluvial, residual, colluvial and Karst.

Mean annual precipitation ranges from 12 inches/30.5 cms at the lowest elevations to 40 inches/102 cms at the highest elevations. Elevational differences account for the large variation in precipitation. Most precipitation occurs in the spring and summer season with 60 percent of the precipitation falling as rain. The mean annual air temperature is 32 to 37 degrees F/0.0-2.8 degrees C.

Streams typically occur on narrow canyons and valleys. The landscape is slightly dissected.

The primary natural disturbance processes are fire, insects, disease and windthrow. Human-caused disturbances include logging, grazing, recreational developments and powerlines and roads.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountainsides and canyons.

The mountainsides are located on mid to high elevation sites with dominant slope gradients from 50 to 90 percent. These landscapes include ridges, mountain slopes and block faces landforms that are formed in sedimentary parent material. The primary soils are shallow to deep and well drained. Surface textures are generally loamy or silty. These soils are classified as Argic Cryoborolls, Cryic Paleborolls, and Mollic Cryoboralfs often associated with subalpine fir and Douglas-fir vegetation.

The canyons are located on all elevational ranges with dominant slope gradient from 50 to 90 percent. These landscapes include steep mountain faces and canyon walls generally with streams in the bottoms. They formed in sedimentary parent materials. The primary soils are shallow to moderately deep and well drained. Surface textures are generally loamy or silty. These soils are classified as Pachic Cryoborolls, Argic Cryoborolls, and Mollic Cryoboralfs often associated with mountain big sagebrush, curlleaf mahogany and Douglas-fir potential natural vegetation.

Compiled By: Caribou National Forest

M331Dd Bear River Highlands

Location: This subsection is located in the Bear River basin of southeastern Idaho.

Subsection Concept: This subsection consists of glaciated mountains, canyons, broad basins, meadows and foothills formed from limestone, dolomite and quartzite that have been modified by glaciation, periglaciation, Karst and fluvial processes. The major general vegetative types include coniferous forest and shrublands. This map unit is separated from similar subsections based upon glaciated features and Karst topography influenced by climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains and broad valleys have an elevation range of 5,900 to 9,500 feet/1,798 to 2,895 meters. The dominant slope range is 10 to 60 percent. The dominant types of rocks are Brigham quartzite, Nounan limestone, Wasatch limestone, St. Charles limestone, Laketown dolomite and Hyrum dolomite. The primary geomorphic processes in these landscapes are glacial, Karst, residual, colluvial and fluvial.

Mean annual precipitation ranges from 12 inches/30.5 cms at lowest elevations to 40 inches/102 cms at the highest elevations. Most precipitation occurs in the fall and winter with 52 percent of the precipitation falling as snow. The mean annual air temperature is 34 to 39 degrees F/1.1 to 3.9 degrees C.

Streams typically occur in canyons with the Logan River flowing from Franklin Basin at the top of the range. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are fire, insects, disease, and windthrow. Fire occurred historically every 21 years. Human-caused disturbances include grazing and logging with some mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountains, broad basins, and foothills.

The mountains are located on all elevation sites with dominant slope gradients from 10 to 60 percent. These landscapes include ridges and mountain slopes that are formed in sedimentary parent materials. The primary soils are shallow to very deep and well drained. Soils on the ridges are shallow and the mountain slopes and foothills are moderately deep to very deep. Surface textures are generally silt to loam. These soils are classified as Argic Cryoborolls, Cryic Paleborolls and Pachic Cryoborolls associated with aspen, Douglas-fir and sagebrush potential natural vegetation.

The broad valleys are located on high elevation sites with dominant slope gradients from 5 to 35 percent. These landscapes include bottoms and plateaus on the top of the mountain crest formed from sedimentary parent materials. The primary soils are very deep and somewhat poorly drained to somewhat excessively drained. Surface textures are loam or silt loam. These soils are classified as Mollic Cryoboralfs and Argic Cryoborolls associated with tall forb and sagebrush potential natural vegetation.

The foothills are located on low elevation sites with dominant slope gradients from 10 to 50 percent. These landscapes include rolling hills, fans and foothills of mountains formed from sedimentary parent materials. The primary soils are deep to very deep and well drained. Surface textures are loam and silt loam. These soils are classified as Argic Cryoborolls, Argic Pachic Cryoborolls and Pachic Cryoborolls associated with sagebrush, mountainbrush and aspen cover types.

Compiled By: Caribou National Forest

M331De Bear River Valley

Location: This subsection is located in the Bear River basin of southeast Idaho.

Subsection Concept: This subsection consists of open valley, rolling hills and foothills of Salt Lake and Twin Creeks Formations that have been modified by alluvial and colluvial processes. The major general vegetative types include grasslands and shrublands. This map unit is separated from similar subsections based upon low elevation, parent material or climatic/vegetative factors that are different from the surrounding mountains.

Subsection Setting and General Characteristics: These valleys and rolling foothills have an elevation range of 6,000 to 7,000 feet/1,829 to 2,134 meters. The dominant slope range is 0 to 30 percent. The dominant types of rocks are limestone, stream alluvium, basalt, deposits from alluvial fans near the mountains and travertine. Mudstone, conglomerate and sandstone are also found. The primary geomorphic processes in these landscapes are alluvial, colluvial and residual.

Mean annual precipitation ranges from 13 inches/33 cms at the lowest elevations to 16 inches/41 cms at the highest elevations. Most precipitation occurs in the winter and spring with 54 percent of the precipitation falling as snow. The mean annual air temperature is 33 to 38 degrees F/0.5-3.3 degrees C.

Rivers and streams typically occur on bottomlands in valley. The landscape is slightly to moderately dissected. Wetlands occur along the the Bear River and in the floodplains north of Bear Lake associated with depositional areas.

The primary natural disturbance processes are fire, insects, disease, flooding, and mass failures. Human-caused disturbances include farming and agricultural based activities such as grazing and road construction.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms and rolling foothills.

The valley bottoms are located on lowest elevation sites with dominant slope gradients from 0 to 20 percent. These landscapes include stream terraces and floodplains that formed from alluvial parent materials. The primary soils are very deep and somewhat poorly drained. The surface textures are generally gravelly sandy loam or gravelly loam. These soils are classified as Cumulic Cryaquolls and Pachic Cryoborolls associated with wetland vegetation and aspen potential natural vegetation.

The rolling foothills are located along the base of the Bear River Mountain range and Aspen Mountain range and are the highest elevation sites with dominant slope gradients from 15 to 30 percent. These landscapes include alluvial fans, rolling hills and foothills formed in residuum and colluvium from sedimentary and alluvial materials. The primary soils are very deep and well drained and have surface textures of loam or silty loam. These soils are classified as Calcic Haploxerolls and Calcic Argixerolls associated with big sagebrush and grass potential natural vegetation.

Compiled By: Caribou National Forest

M331Df Wyoming Range Uplands

Location: This subsection is located in the Greys River drainage of northwestern Wyoming.

Subsection Concept: This subsection consists of the overthrust belt which consists of north-south arcuate trending ridges of Paleozoic and Mesozoic sedimentary bedrock that have been modified by thrust-faulting, folding, glaciation, and mass failure. The major general vegetative types include subalpine fir, Douglas fir, Engelmann spruce, whitebark pine, and aspen with grouse whortleberry, common snowberry, mountain maple, mountain big sagebrush, subalpine big sagebrush, Oregon grape, Idaho fescue, pinegrass, and tall forbs. This map unit is separated from similar subsections based upon geologic structure and climatic/vegetative factors. The major differentiating criteria for this area is the climatic influence the high elevation has on the overthrust landscape vegetative component.

Subsection Setting and General Characteristics: There are four mountain ranges that comprise this subsection the Salt River Range, the Snake River Range, the Wyoming Range, and the Hoback Range. The geology is dominated by Paleozoic and Mesozoic sedimentary rock formations including Thaynes Limestone, Ankareh Redbeds, Nugget Sandstone, Twin Creek Limestone, Preuss Redbeds, Amsden Formation, Wells Formation, Madison Limestone, Big Horn Dolomite, Gallatin Limestone, and the Gros Ventre Formation that have been modified by thrust faulting and glaciation with an elevation range of 6,500 to 10,900 feet. The dominant slope range is 10 to 70 percent. The dominant types of rocks are limestone, dolomite, mudstone, sandstone, and shale. The primary geomorphic processes in these landscapes are colluvial and glacial.

Mean annual precipitation ranges from 20 inches in the Star Valley to 60 inches in the upper elevations of the Wyoming Range. Most precipitation occurs in the winter with 30 percent of the precipitation falling as snow. The mean annual air temperature is less than 32 degrees F to 40 degrees F.

Streams and the Greys Rivers typically occur in strike valleys. The landscape is highly dissected. Wetlands occur along streams and the Greys River with alluvial and glacial deposits. Lakes occur in the upper mountains where glaciers have scoured depressions and where glacial or landslide deposits have trapped seasonal runoff.

The primary natural disturbance processes are fire, insects, disease, and mass failures. Human-caused disturbances include logging, domestic grazing, mining, and recreational trails.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include the mountain ranges, remnant terrace, and stream-cut valleys.

The mountain ranges are located on high elevation sites with dominant slope gradients from 40 to 100 percent. This landscape include mountain peaks, cirque headwalls, cirque basins, scarpslopes, and ridges that are formed in limestone, sandstone, shale, and mudstone. The primary soils are 20 to 40 inches thick and have gravelly and very gravelly clay loam and sandy clay loam textures. These soils are classified as Typic Cryoborolls, Typic Cryorthents, and Lithic Cryorthents. The dominant potential natural vegetation is subalpine fir/Oregon grape, subalpine fir/common snowberry, subalpine fir/grouse whortleberry, Engelmann spruce/grouse whortleberry, and tall forbs.

The remnant terraces are located on mid elevation sites with dominant slope gradients from 0 to 40 percent. This landscape includes upland benches, old pediment surfaces, landslides, and mountain sideslopes formed in sandstone, shale, siltstone, mudstone, and fanglomerate. The primary soils are generally 60 inches thick and have silt loam and silty clay loam surface textures with

gravelly and very gravelly silty clay loam subsoils. These soils are classified as Typic Cryoboralfs, Argic Cryoborolls, Mollic Cryoboralfs. The dominant potential natural vegetation is subalpine fir/pinegrass, Douglas fir/blue huckleberry, subalpine fir/grouse whortleberry, and Engelmann spruce/grouse whortleberry.

The valleys are located on low elevation sites with dominant slope gradients from 0 to 40 percent. This landscape includes alluvial fans, terraces, floodplains, stream bottoms, and toes of landslides and debris flows that are formed in various materials. The primary soils are 60 inches thick and have various textures. These soils are classified as Cumulic Cryoborolls, Mollic Cryofluvents, Argic Cryoborolls, and Typic Cryoborolls. The dominant potential natural vegetation consist of riparian communities along streams and the Greys River. Drier potential natural vegetation types occur on terraces which include mountain big sagebrush/Idaho fescue, subalpine big sagebrush/mountain brome, and subalpine fir/heartleaf arnica.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Dg Webster Ridges and Valleys

Location: This subsection is located in the Salt River and Blackfoot River basins of southeast Idaho.

Subsection Concept: This subsection consists of ridges and valleys of Mesozoic sedimentary bedrock that has been modified by gravitational transfer by landslides, fluvial and residual geomorphic processes. The major general vegetative types include coniferous forest and shrublands. This map unit is separated from similar subsections based upon Phosphoria deposits, mountainous area vegetated with conifers and sagebrush due to climatic factors.

Subsection Setting and General Characteristics: These ridges and valleys have an elevation range of 6,400 to 9,957 feet/1,950 to 3,035 meters. The dominant slope range is 15 to 65 percent. The dominant types of rocks are limestone, siltstone, conglomerate, sandstone, and Rex Chert. The primary geomorphic processes in these landscapes are fluvial, residual, colluvial and gravitational transfer by mass wasting.

Mean annual precipitation ranges from 24 inches/61 cm at the lowest elevations to 40 inches/102 cms at the highest elevations. Most precipitation occurs in the winter and spring seasons with 54 percent of the precipitation falling as snow. The mean annual air temperature is 29 to 38 degrees F/-1.7 to 3.3 degrees C.

Streams and rivers typically occur in valleys and canyons. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are fire, insects, disease, windthrow, and mass failures. Human-caused disturbances include mining of phosphates, logging, and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain ridges and valleys.

The mountain ridges are located on low to high elevation sites with dominant slope gradients from 15 to 65 percent. These landscapes include mountain sideslopes and ridges that are formed in sedimentary parent materials. The primary soils are shallow to very deep and well drained. Surface textures of these soils are generally loam and silt loam. These soils are classified as Argic Cryoborolls, Typic Cryochrepts, Mollic Cryoboralfs associated with subalpine fir, lodgepole pine and big sagebrush potential natural vegetation.

The valleys are located on the lowest elevation sites with dominant slope gradients from 15 to 30 percent. These landscapes include valley bottoms and canyons that are formed in alluvial and residual parent materials. The primary soils are very deep and well to somewhat poorly drained. Surface textures of these soils is generally loam. These soils are classified as Pachic Cryoborolls, Cumulic Cryoborolls and Argic Pachic Cryoborolls associated with willow and wetland vegetation, aspen and sagebrush potential natural vegetation.

Compiled By: Caribou National Forest

M331Dh Grays Lake Bottomlands

Location: This subsection is located in the Blackfoot River basin of southeast Idaho.

Subsection Concept: This subsection consists of rolling hills and bottomlands of sedimentary and basalt bedrock that have been modified by alluvial and fluvial geomorphic processes in the bottomlands and residual and colluvial geomorphic processes in the rolling hills. The major general vegetative types include grasslands and shrublands. This map unit is separated from similar subsections based upon large areas of wetlands and a drier climate than surrounding mountainous subsections.

Subsection Setting and General Characteristics: These bottomlands and rolling hills have an elevation range of 6,500 to 7,200 feet/1,981 to 2,195 meters. The dominant slope range is 0 to 30 percent. The dominant types of rocks are mudstone, sandstone, conglomerate with some basalt. The primary geomorphic processes in these landscapes are alluvial, fluvial, residual and colluvial.

Mean annual precipitation ranges from 18 inches/46 cms on lowest elevations to 24 inches/61 cms on the highest elevations. Most precipitation occurs in the spring and winter seasons with 54 percent of the precipitation falling as snow. The mean annual air temperature is 36 to 41 degrees F/2.2 to 5.0 degrees C.

Streams typically occur draining Grays Lake and flowing into Grays Lake. The landscape is slightly dissected. Wetlands occur in the bottomlands of Grays Lake and are extensive in this subsection. They are associated with alluvial deposits. Grays Lake is located on the lowest bottomlands of the subsection.

The primary natural disturbance processes are fire, flooding, and mass failures. Human-caused disturbances include grazing and gravel mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include bottomlands and rolling hills.

The bottomlands are located on low elevation sites with dominant slope gradients from 0 to 5 percent. These landscapes include flat lands where the Grays Lake occurs that is formed in alluvial parent materials. The primary soils are very deep and poorly drained. Surface textures are generally peaty. These soils are classified as Euc Terric Borohemists. The dominant potential natural vegetation is sedges and grasses.

The rolling hills are located on the mid elevation sites with dominant slope gradients from 15 to 30 percent. These landscapes include ridges and hillslopes that are formed in residuum and colluvium from sedimentary and basalt parent materials. The primary soils are deep to very deep and well drained. Surface textures are loam and sandy loam. These soils are classified as Argic Pachic Cryoborolls and Calcic Pachic Cryoborolls associated with sagebrush/grass potential natural vegetation.

Compiled By: Caribou National Forest

M331Di Caribou Range

Location: This subsection is located in the Salt River basin of southeast Idaho.

Subsection Concept: This subsection consists of mountain ranges and valleys of Mesozoic aged sedimentary rock that have been modified by landslides, fluvial and residual geomorphic processes. The major general vegetative types include coniferous forest, grasslands, and shrublands. This map unit is separated from similar subsections based upon mountainous areas apart from the surrounding valley subsections. Climate is also a differentiating criteria.

Subsection Setting and General Characteristics: These mountain ranges and valleys have an elevation range of 5,600 to 9,800 feet/1,707 to 2,987 meters. The dominant slope range is 5 to 60 percent. The dominant types of rocks are limestone, dolomite, siltstone, conglomerate and sandstone. The primary geomorphic processes in these landscapes are fluvial, residual and gravitational transfer by landslides.

Mean annual precipitation ranges from 28 inches/71 cms on the lowest elevations to 40 inches/102 cms on the highest elevations. Most precipitation occurs in the spring and winter seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 29 to 38 degrees F/-1.7 to 3.3 degrees C.

Streams typically occur in valley bottoms. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are fire, insects, disease, windthrow and mass failures. Human-caused disturbances include mining for gold and dredging, logging, and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain ranges and valleys.

The mountain ranges are located on high elevation sites with dominant slope gradients from 20 to 40 percent. These landscapes include ridges, mountain slopes and canyons that are formed in sedimentary parent materials. The primary soils are shallow to deep and well drained. Surface textures are generally silt loam or loam. These soils are classified as Argic Cryoborolls, Typic Cryochrepts, Mollic Cryoboralfs associated with subalpine fir and sagebrush potential natural vegetation.

The valleys are located on low to mid elevation sites with dominant slope gradients from 5 to 30 percent. These landscapes include draws and open basins that formed in sedimentary parent materials. The primary soils are moderately deep to very deep and well drained. Surface textures are loam or silt loam. These soils are classified as Argic Cryoborolls, Argic Pachic Cryoborolls and Pachic Cryoborolls associated with sagebrush and grass potential natural vegetation.

Compiled By: Caribou National Forest

M331Dj Star Valley

Location: This subsection is located in the Salt River basin of southeast Idaho and western Wyoming.

Subsection Concept: This subsection consists of valley bottoms, rolling hills, and foothills of Cenozoic aged sedimentary bedrock that has been modified by alluvial and fluvial geomorphic processes. The major general vegetative types include willow bottoms, grasslands and shrublands. This map unit is separated from similar subsections based upon drier and cool climates and valley geomorphology that is distinctly different than the adjoining mountainous subsections.

Subsection Setting and General Characteristics: These valley bottoms, rolling hills and foothills have an elevation range of 5,000 to 6,300 feet/1,524 to 1,920 meters. The dominant slope range is 0 to 30 percent. The dominant types of rocks are limestone, siltstone, conglomerate sandstone and stream alluvium. The primary geomorphic processes in these landscapes are fluvial, residual, and alluvial.

Mean annual precipitation ranges from 18 inches/46 cms at the lowest elevations to 24 inches/61 cms at the highest locations. Most precipitation occurs in the winter and spring with 60 percent of the precipitation falling as snow. The mean annual air temperature is 32 to 36 degrees F/0.0 to 2.2 degrees C.

Streams and rivers typically occur on valley bottoms. The landscape is slightly dissected. Wetlands occur in the the valley bottoms associated with stream alluvium. Palisades reservoir is located within the subsection.

The primary natural disturbance processes are flooding and mass failures. Human-caused disturbances include farming and agricultural based industry including grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, rolling hills and foothills.

The valley bottoms are located on low elevation sites with dominant slope gradients from 0 to 15 percent. These landscapes include stream terraces and drainageways that are formed in alluvium. The primary soils are very deep and somewhat poorly drained. Surface textures are generally silt loam, sandy loam or loam. These soils are classified as Cumulic Cryaquolls associated with willow and sedge potential natural vegetation.

The rolling hills are located on mid elevation sites with dominant slope gradients from 10 to 30 percent. These landscapes include hills that are formed in residuum from sedimentary parent material. The primary soils are deep to very deep and well drained. Surface textures are generally loam. These soils are classified as Calcic Argixerolls and Calcic Haploxerolls associated with aspen, big sagebrush and grass potential natural vegetation.

The foothills are located on high elevation sites with dominant slope gradients from 10 to 30 percent. These landscapes include hills that are formed in residuum and alluvium from sedimentary parent material. The primary soils are deep to very deep and well drained. Surface textures are generally loam or sandy loam. These soils are classified as Calcic Argixerolls and Calcic Haploxerolls associated with aspen and big sagebrush potential natural vegetation.

Compiled By: Caribou National Forest

M331Dk Big hole Mountains/Snake River River Range

Location: This subsection is located in the Upper Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection is a mountain range that consists of multiple, parallel overthrusts and benches (in the northern part) of mixed rocks and eolian material that have been modified by thrust faulting. The major general vegetative types include conifer forest and brushland. This map unit is separated from similar subsections based upon lithology. The lithology of this subsection is complex compared to adjacent subsections. Parent material consists of weathered rock overlaid by loess.

Subsection Setting and General Characteristics: These overthrust mountains have an elevation range of 5200 to 10,000 feet/1600 to 3050 meters. The dominant slope range is 4 to 70 percent. The dominant types of rocks are sandstone, limestone, shale and rhyolite. Glacial drift and elian materials are also present in this subsection. The primary geomorphic processes in these landscapes are fluvial, colluvial, mass wasting, alpine glacial scouring and deposition.

Mean annual precipitation ranges from 20 inches/51 cms in the valley bottoms to 30 inches/76 cms on the mountain tops. Precipitation is uniformly distributed throughout the year with 55 percent of the precipitation falling as snow. The mean annual air temperature is 38 to 40 degrees F/3 to 4 degrees C.

Rivers, perennial streams and intermittent streams typically occur in valleys. The landscape is highly dissected.

The primary natural disturbance processes are fire and mass failures. Human-caused disturbances include logging and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include moderate relief mountains on mid elevations and high relief mountains on mid elevations.

The moderate relief mountains are located on mid elevation sites with dominant slope gradients from 4 to 40 percent. These landscapes include mountain sideslope landforms that are formed in colluvium from mixed sedimentary rock. The primary soils are greater than 60 inches to bedrock with loamy surface textures and clayey subsurface textures. These soils are classified as Pachic Cryoborolls, Argic Pachic Cryoborolls Cryic Pachic Paleborolls, Typic Paleborolls and Dystric Cryochrepts. The dominant potential natural vegetation is mountain big sagebrush/Idaho fescue h.t.; subalpine fir/mallow ninebark h.t.; Douglas-fir/grouse whortleberry; subalpine fir/blue huckleberry h.t.

The high relief mountains are located on mid elevation sites with dominant slope gradients from 30 to 70 percent. These landscapes include mountain sideslope landforms that are formed in colluvium derived from limestone and loess. The primary soils are greater than 60 inches to bedrock with loamy surface and subsurface textures. These soils are classified as Calcic Cryoborolls and Aridic Calcixerolls. The dominant potential natural vegetation is subalpine fir/mallow ninebark h.t.; limber pine/spike fescue h.t.

Comments: This delineation consist of Landtype Association Units 601, 602 and 603

Compiled By: Targhee National Forest; Terry Bowerman and Terry Craig.

M331Dm Teton Range

Location: This subsection is located in the Upper Snake River Basin of southeastern Idaho and northwestern Wyoming

Subsection Concept: This subsection consists of a ramp-like, north-south mountain range with a spectacular line of high peaks rising abruptly along the west side of Jackson Hole and gentle west side dipping down to the edge of Idaho's Teton valley. Mixed bedrock types have been modified by glaciation, periglaciation and fluvial erosion. The major general vegetative types include Douglas-fir forest. This map unit is separated from similar subsections based upon lithology, geologic structure and topography. The ruggedness of the mountain range and heavy glacial influence set it apart from adjacent subsections. Parent material consists of weathered rock overlaid by loess.

Subsection Setting and General Characteristics: These fault block mountains have an elevation range of 6500 to 13,766 feet/2000 to 4200 meters. The dominant slope range is 4 to 40 percent on western slopes, 60 to perpendicular in eastern part and in glaciated valleys. The dominant types of rocks are granite, limestone, sandstone, dolomite, slate, gneiss, quartzite and loess. Rhyolite tuff flows blanket sedimentary rocks on the west slopes of the subsection. The primary geomorphic processes in these landscapes are glacial, periglacial, colluvial and fluvial.

Mean annual precipitation ranges from 24 inches/60 cms at lower elevations to 56 inches/140 cms at higher elevations. Precipitation is uniformly distributed throughout the year with 55 percent of the precipitation falling as snow. The mean annual air temperature is 38 to 42 degrees F/-1 to 3 degrees C.

Streams and rivers typically occur in valleys. The landscape is highly dissected. Lakes occur in cirques.

The primary natural disturbance processes are fire and mass failures. Human-caused disturbances include ski resort development.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include ground moraines on lower elevations, mountain sideslopes at mid elevations and summits, shoulders and sideslopes of mountains on higher elevations.

The lower elevations have a dominant slope gradient of 4 to 20 percent. These landscapes include ground moraines that formed in local alluvium derived dominantly from loess. The primary soils are silt loam surface and subsurface textures. These soils are classified as Typic Paleboralfs. The dominant potential natural vegetation is Douglas-fir/grouse blueberry h.t. Present vegetation commonly supported includes a lodgepole pine/grouse blueberry c.t. on late seral stands; lodgepole pine/pinegrass or lodgepole pine/elk sedge c.t.s and communities dominated by lodgepole pine and nonnative grasses are supported in plantations and regenerating clearcuts; and communities dominated by pinegrass, elk sedge or nonnative grasses are supported in recent clearcut and scarified areas.

The mid elevations have a dominant slope gradient from 30 to 55 percent. These landscapes include mountain sideslopes that are formed in limestone and dolomite. The primary soils are very deep with gravelly loam surface textures and very gravelly loam subsurface textures. These soils are classified as Typic Cryoborolls, Typic Cryochrepts and Typic Cryoboralfs. The dominant potential natural vegetation is subalpine fir/mountain maple h.t., pachistima phase.

The higher elevations have a dominant slope gradient from 4 to 70 percent.

These landscapes include summits, shoulders and sideslopes of mountains that formed in limestone and dolomite. The primary soils are shallow with silt loam through very gravelly silt loam surface textures and gravelly silt loam through extremely stony silt loam subsurface textures. These soils are classified as Lithic Cryoborolls and Lithic Cryochrepts. The dominant potential natural vegetation is an alpine meadow. Present vegetation commonly supported includes communities dominated by sheep fescue, bluebunch wheatgrass, other native grasses and alpine forbs are commonly supported.

Compiled By: Targhee National Forest; Terry Bowerman and Terry Craig
Used map units 1302 and Grand Targhee EIS

M331Do Pinyon Peak Highlands

Location: This subsection is located in the upper Snake River drainage of northwestern Wyoming.

Subsection Concept: This subsection consists mainly of a series of rounded ridges, tending northeasterly and southwesterly composed of, dominantly, Mesozoic sedimentary bedrocks that have been modified by faulting and folding of strata with coarse breccia and broken fields of rhyolite. The major general vegetative types include subalpine fir, lodgepole pine, and whitebark pine overstory species with grouse whortleberry, mountain gooseberry, russett buffaloberry understory vegetation. Tall forb meadows are common and are composed of lupine, sticky geranium, and duncecap delphinium. This map unit is separated from similar subsections based upon geologic structure, parent material and vegetative factors. The primary geomorphic processes of the area are glaciation and mass failures and are the source of the gentle rolling landscape.

Subsection Setting and General Characteristics: Pinyon Conglomerate, Harebell Formation, and the Sohare Formation and Bacon Ridge Sandstone have an elevation range of 8,000 to 9,300 feet. Huckleberry Ridge Tuff and other volcanic deposits have a elevation range of 7,000 to 9,700 feet and are commonly found in the northwestern and northeastern corners of the unit. The dominant slope range is 10 to 70 percent. The dominant types of rocks are conglomerates and sandstones, with volcanic breccia and rhyolites. The geomorphic processes in these landscapes are glacial, colluvial, and fluvial.

Mean annual precipitation ranges from 30 inches along the lower western flank to 50 inches on the higher eastern elevations. Most precipitation occurs in the winter with 30 percent of the precipitation falling as snow. The mean annual air temperature is 34 to 39 degrees F.

Streams typically occur in glacial valleys. The landscape is highly dissected. Wetlands occur along Jackson Lake associated with alluvial and glacial deposits. Lakes occur along the western fringe of the unit and in glacially created depressions.

The primary natural disturbance processes are fire, insects, disease, and mass failures. Human-caused disturbances include recreational trails.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include glaciated mountains, meadows, and foothills.

The glaciated mountains are located on high elevation sites with dominant slope gradients from 40 to 70 percent. This landscape includes plateaus, gentle peaks, and scarp slopes that are formed in Tertiary conglomerate, shale, and sandstone materials. The primary soils are 40 to 60 inches thick and have silt loam and clay loam surface textures with gravelly to very gravelly silty clay loam subsoils. These soils are classified as Typic Cryochrepts and Typic Cryoboralfs. The dominant potential natural vegetation includes subalpine fir/grouse whortleberry and whitebark pine/grouse whortleberry with inclusions of Engelmann spruce, Douglas fir, and aspen types along with mountain gooseberry and russett buffaloberry.

The meadows are located on low and mid elevation sites with dominant slope gradients from 10 to 40 percent. This landscape includes rolling mountain sideslopes and glacial moraines. The primary soils are 40 to 60 inches thick and have clay loam and silty clay loam surface textures with gravelly and very gravelly silty clay loam and silty clay subsoils. These soils are classified as Typic Cryoboralfs and Argic Pachic Cryoborolls. The dominant potential natural vegetation is tall forb and grass with mountain big sagebrush types along with inclusions of aspen community types. Wetter sites include riparian

community types.

The foothills are located on lower elevation sites with dominant slope gradients from 10 to 60 percent. This landscape includes glacial moraines, ridges, escarpments, dip slopes, and basaltic plateaus that are formed in mixed glacial and landslide materials with volcanic flows. The primary soils are 40 to 60 inches thick and have silt loam to clay loam surface texture with gravelly to very gravelly silty clay loam subsoils. These soils are classified as Typic Cryoboralfs and Typic Cryochrepts. The dominant potential natural vegetation is subalpine fir/grouse whortleberry with inclusions of Engelmann spruce and aspen types.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Dp Gros Ventre-Leidy Uplands

Location: This subsection is located in the upper Gros Ventre River drainage of northwestern Wyoming.

Subsection Concept: This subsection consists of folded thrust fault block structures of Mesozoic and Paleozoic sedimentary bedrock that have been modified by glaciation and mass movement. The major general vegetative types include subalpine fir, Engelmann spruce, whitebark pine, and Douglas fir with grouse whortleberry, huckleberry, and russett buffaloberry understories. This map unit is separated from similar subsections based upon geologic structure and parent material factors. The major differentiating criteria for this area is its more resistant geologic material.

Subsection Setting and General Characteristics: In the Mount Leidy Highlands the geology is dominated by Triassic, Cretaceous, and Tertiary sedimentary rock formations including Chugwater Formation, Sundance and Gypsum Spring Formations, Frontier Formation, Cody Shale, Sohare Formation, Bacon Ridge Sandstone, and Pinyon Conglomerate with an elevation range of 7,000 to 10,300 feet. Landslides and glacial deposits are common. The dominant slope range is 10 to 60 percent. The dominant types of rocks are sandstone, shale, and conglomerate. The primary geomorphic processes in this landscape are glacial and colluvial. In the Gros Ventre Mountains the geology is dominated by Tensleep Sandstone and Madison Limestone have an elevation range of 8,500 to 11,500 feet. The dominant slope range is 10 to 90 percent. The dominant types of rocks are sandstone, limestone, and dolomite. The primary geomorphic processes in this landscape are glacial and residual.

Mean annual precipitation ranges from 20 inches at Hoback Junction to 60 inches in Gros Ventre Mountains. Most precipitation occurs in the winter with 30 of the precipitation falling as snow. The mean annual air temperature is 32 to 36 degrees F.

Streams and rivers typically occur in glacial valleys. The landscape is highly dissected. Wetlands occur along streams and rivers along with wet meadows associated with alluvial, glacial and landslide deposits. Lakes occur in glaciated created depressions and where glacial and/or landslide deposits trap seasonal runoff.

The primary natural disturbance processes are fire, insects, disease, and mass failures. Human-caused disturbances include logging, domestic grazing, mining, and recreational trails.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountain peaks, glacial valleys, glaciated mountains.

The mountain peaks are located on high elevation sites with dominant slope gradients from 10 to 90 percent). This landscape includes talus slopes, dip slopes, ridges, and cirques that are formed in limestone and sandstone materials. The primary soils are 0 to 40 inches thick and have sandy loam, loam, and clay loam surface textures with gravelly to extremely gravelly loam subsoils. These soils are classified as Typic Cryochrepts and Lithic Cryorthents. The dominant potential natural vegetation is dominated by alpine vegetation including arctic willow and marsh marigold. Isolated krumholtz stands of subalpine fir, Engelmann spruce, and whitebark pine are also present.

The glaciated mountains are located on mid elevation sites with dominant slope gradients from 10 to 70 percent). This landscape includes mountain sideslopes, glacial moraines, landslides, that are formed in sandstone, shale, conglomerate, and mudstone materials. The primary soils are 40 to 60 inches thick and have silt loam and clay loam surface textures with gravelly to

extremely gravelly silty clay loam subsoils. These soils are classified as Typic Cryoboralfs and Argic Cryoborolls. The dominant potential natural vegetation is subalpine fir/grouse whortleberry, subalpine/heartleaf arnica, and subalpine fir/blue huckleberry. Engelmann spruce, Douglas fir, and aspen types are also present.

The glacial valleys are located on low elevation sites with dominant slope gradients from 10 to 60 percent. This landscape includes glacial scoured slopes, troughs, and bottomlands that are formed in glacial, fluvial, and landslide materials. The primary soils are 10 to 60 inches thick and are highly variable in texture. These soils are classified as Cumulic Cryoborolls and Typic Cryofluvents. The dominant potential natural vegetation includes riparian community types with Engelmann spruce/common horsetail on wetter sites. Potential natural vegetation on drier sites include Engelmann spruce/twinflower and Engelmann spruce/mountain gooseberry. Douglas fir types and tall forb meadows are also present.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Dt Jackson Hole

Location: This subsection is located within the upper Snake River drainage of northwestern Wyoming.

Subsection Concept: This subsection represents a dip-slip faulted landscape where the valley occupies the lower portion of the faulted sequence with the Teton Range rising along the western portion of the fault. The landscape was later eroded and glaciated to create the rounded buttes and foothills above the valley floor. Common landforms include glacial outwash plains and moraines with moderate fluvial dissection along the Snake, Gros Ventre, and Buffalo Rivers. Bedrock consists of Paleozoic and Mesozoic sedimentary rock that has been, for the most part, buried by glacial and fluvial deposits. The vegetation consists of large areas of sagebrush and riparian communities with islands and fringes of conifer and aspen communities. This unit is separated from similar subsections based on its geologic and geomorphic composition and its climatic setting.

Subsection Setting and General Characteristics: The valley has an elevation range of 6000 to 7700 feet. The slope range is 0 to 60 percent. The dominant types of parent materials for soils include glacial till and outwash material of various origins with limestone, sandstone, claystone, siltstone, conglomerate, and andesite occurring in butte and foothill areas. The primary geomorphic processes in this landscape are glacial, colluvial, and fluvial.

Mean annual precipitation ranges from 16 inches at lower elevations to 40 inches at higher elevations. Most precipitation occurs in the winter with 50 percent of the precipitation falling as snow. The mean annual air temperature is 32 to 36 degrees F.

Streams and rivers typically follow historical fluvial dissections with larger riparian areas and wetlands developing where slopes decrease. The landscape is moderately dissected. The primary processes of natural disturbance are fire, insects, disease, and wildlife. Human-caused disturbances include fire, recreational trails, agricultural pastures, livestock grazing, subdivisions, and highways.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. Glacial outwash plains, moraines, stream terraces, and alluvial fans occupy the majority of the valley floor and foothills and buttes occur along the fringe of the valley with buttes rinsing out the valley floor resembling islands in a sea of Quaternary derived material.

The lower elevations of the subsection have a dominant slope gradient of 0 to 40 percent. This landscape includes stream terraces, alluvial fans, and flood plains. These landforms are typically formed in Quaternary glacial moraine, outwash, and stream deposits. The primary soils are 40 to 60 inches deep with sandy loam and gravelly loam surface textures with very gravelly subsoils. These soils are classified as Typic Cryoborolls, Mollic Cryofluvents, and Typic Cryaquolls. The potential natural vegetation is mountain big sagebrush/Idaho fescue, Douglas fir/Oregon grape, Engelmann spruce/horsetail, narrowleaf cottonwood/bunchberry, and sedge community types.

The upper elevations the subsection have a dominant slope gradient of 5 to 60 percent. These landscapes include residual and colluvial buttes and foothills that are formed in variable sedimentary bedrock including sandstone, limestone, claystone, siltstone, andesite and conglomerate. The primary soils are 20 to 60 inches deep with loam and very stony sandy loam surfaces with loam and very stony sandy clay loam subsoils. These soils are classified as Typic Cryochrepts, Typic Cryoborolls and Typic Cryorthents. The potential natural vegetations is subalpine fir/grouse whortleberry, Douglas fir/pinegrass, and aspen/common snowberry.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Du Basin and Range Transitional Mountains

Location: This subsection is located in the Portneuf River basin of southeast Idaho.

Subsection Concept: This subsection consists of the Bannock and Malad mountain ranges of Paleozoic aged sedimentary and volcanic rock that have been modified by fluvial, colluvial and residual geomorphic processes. The major general vegetative types include coniferous forest and shrublands. This map unit is separated from similar subsections based upon the transitional characteristics of the Basin and Range geomorphic features. Climate is more moist and cooler than surrounding subsections.

Subsection Setting and General Characteristics: These mountain ranges have an elevation range of 5,600 to 9,095 feet/1,707 to 1,091 meters. The dominant slope range is 30 to 70 percent. The dominant types of rocks are limestone, dolomite, siltstone, conglomerate, sandstone and volcanic materials. The primary geomorphic processes in these landscapes are fluvial, residual, and colluvial.

Mean annual precipitation ranges from 18 inches/46 cms at the lowest elevations to 30 inches/76 cms at the highest elevations. Most precipitation occurs in the winter and spring with 54 percent of the precipitation falling as snow. The mean annual air temperature is 29 to 38 degrees F/-1.7 to 3.3 degrees C.

Streams typically occur in the drainageways and canyons. The landscape is slightly to moderately dissected.

The primary natural disturbance processes are fire, insects, disease, windthrow. Human-caused disturbances include logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountains and narrow valleys.

The mountain ranges are located on high elevation sites with dominant slope gradients from 30 to 70 percent. These landscapes include mountain slopes and ridges that are formed in sedimentary parent materials. The primary soils are shallow to deep and well drained. Surface textures are generally loam and silt loam. These soils are classified as Pachic Cryoborolls and Argic Cryoborolls associated with sagebrush/maple potential natural vegetation, and Argic Pachic Cryoborolls associated with Douglas-fir potential natural vegetation.

The narrow valleys are located on mid elevation sites with dominant slope gradients from 5 to 20 percent. These landscapes include narrow canyons and valleys that are formed in sedimentary parent materials. The primary soils are deep to very deep and well to somewhat poorly drained. Surface texture are generally loam or sandy loam. These soils are classified as Cumulic Cryoborolls and Pachic Cryoborolls associated with willow/sedge and sagebrush potential natural vegetation.

Compiled By: Caribou National Forest

M331Dv Hoback Basin

Location: This subsection is located in the Hoback River basin of northwestern Wyoming.

Subsection Concept: This subsection consists of an impingement between the Idaho-Wyoming thrust belt, the Hoback Range, and the Gros Ventre uplifts along the eastern margin composed of Cenozoic sedimentary bedrock that have been modified by mass failures, glaciation, and fluvial processes. The major forested vegetative types include subalpine fir, Engelmann spruce, Douglas fir, and aspen with understories of grouse whortleberry, russett buffaloberry, and globe huckleberry. Rangeland vegetation types include mountain big sagebrush, mountain snowberry, bitterbrush, silver sagebrush, shrubby cinquefoil with Idaho fescue, Junegrass, and sedge species. Riparian community types are also present. This map unit is separated from similar subsections based upon geologic structure, parent material, and vegetative factors. The major differentiating criteria for this subsection is its geologic morphology.

Subsection Setting and General Characteristics: Along the eastern flank of the Hoback Range the geology is dominated by Cretaceous and Tertiary sedimentary bedrock consisting of the Coaly sequence, the Mesa Verde sandstone, and the Harebell Formation with the lower flank consisting of the Hoback Formation with an elevation range of 7,200 to 8,200 feet. The dominant slope range is 20 to 70 percent. The dominant types of rocks are sandstone, shale, and conglomerate. On the southern and western flanks of the Gros Ventre Range the geology is dominated by Paleozoic and Mesozoic bedrock including Tensleep Formation, Amsden Formation, Madison and Brazer Limestones, Darby Formation, Dinwoody Formation, Nugget Sandstone, Phosphoria Formation, Preuss and Stump formations with the lower flank consisting of the Gannett Formation with an elevation range of 7,200 to 11,400 feet. The dominant slope range is 20 to 90 percent. The dominant types of rocks are limestone, sandstone, mudstone, shale, and conglomerate. Within the Hoback Basin proper the geology is dominated by Tertiary bedrock and Quaternary material including Hoback Formation, Chappo Member of the Wasatch Formation, Lookout Mountain Conglomerate, and Pass Peak Formation along with glacial till and alluvium with an elevation range of 6,400 to 9,900 feet. The dominant slope range is 10 to 40 percent. The dominant types of rocks are sandstone, shale, and conglomerate. The primary geomorphic processes in these landscapes are residual, glacial, fluvial, and colluvial.

Mean annual precipitation ranges from 20 inches in Bondurant to 60 inches in the Gros Ventre Range. Most precipitation occurs in the winter with 30 percent of the precipitation falling as snow. The mean annual air temperature is <32 degrees F.

Streams and the Hoback River typically occur on the basin floor with Granite Creek flowing along a glacial valley. The landscape is highly dissected. Wetlands occur on the basin floor associated with alluvial and glacial deposits. Most lakes occur in the mountain ranges where glaciers have created depressions or deposited material that traps seasonal runoff.

The primary natural disturbance processes are fire, insects, disease, and mass failures. Human-caused disturbances include hay fields and pastures, rural subdivisions, logging, domestic grazing, and recreational trails.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountain ranges, foothills, and basin floor.

The mountain ranges are located on high elevation sites with dominant slope gradients from 20 to 90 percent. This landscape includes mountain peaks, ridges, cirque headwalls, cirque basins, scarpslopes, cliffs, talus slopes,

and landslides that are formed in sandstone, limestone, shale, and conglomerate. The primary soils are 0 to 40 inches thick and have loam and clay loam surface textures with gravelly to extremely gravelly silty clay loam subsoils. These soils are classified as Lithic Cryoborolls, Typic Cryochrepts, and Typic Cryoboralfs. The dominant potential natural vegetation is subalpine fir/heartleaf arnica, Engelmann spruce/grouse whortleberry, mountain big sagebrush/Idaho fescue, mountain big sagebrush/mountain snowberry/bluebunch wheatgrass. Aspen communities are also present.

The foothills are located on mid elevation sites with dominant slope gradients from 10 to 60 percent. This landscape includes colluvial toeslopes, mountain sideslopes, debris flows, landslides, and benches that are formed in sandstone, shale, and conglomerate. The primary soils are 40 to 60 inches thick with loam and silty clay loam surface textures with gravelly and very gravelly clay loam and silty clay subsoils. These soils are classified as Argic Cryoborolls and Typic Cryoboralfs. The potential natural vegetation is mosaic in composition including subalpine fir/grouse whortleberry, Douglas fir/Oregon grape, Engelmann spruce/grouse whortleberry, aspen-subalpine fir/russett buffaloberry, mountain big sagebrush/Idaho fescue, subalpine big sagebrush/mountain brome, and mountain big sagebrush/mountain snowberry/bluebunch wheatgrass.

The basin floor is located on lower elevation sites with dominant slope gradients from 5 to 40 percent). This landscape includes gentle mountain sideslopes, benches, landslides, earthflows, terraces, glacial moraines, alluvial fans, and bottomlands that are formed in variable materials. The primary soils are 60 inches thick and have variable textures. These soils are classified as Cumulic Cryoborolls, Argic Cryoborolls, and Typic Cryoboralfs. The potential natural vegetation is mosaic in composition including subalpine fir/pinegrass, subalpine fir/white spirea, aspen-subalpine fir/russett buffaloberry, aspen/fernleaf ligusticum, mountain big sagebrush/Idaho fescue, subalpine big sagebrush/mountain brome, and mountain big sagebrush/mountain snowberry/bluebunch wheatgrass. Riparian community type as are present along streams and the Hoback River.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Dw Union Pass Uplands

Location: This subsection is located in the Green River basin of northwestern Wyoming.

Subsection Concept: This subsection consists of a broad glacial undulating valley of Archean, Paleozoic, and Cenozoic rocks that have been modified by glaciation. The major general vegetative types include subalpine fir, Engelmann spruce, aspen, mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, and riparian communities. This map unit is separated from similar subsections based upon geologic structure and climatic/vegetation factors.

Subsection Setting and General Characteristics: The geology is dominated by Pleistocene glacial till and Quaternary mixed alluvium with inclusions of Triassic, Jurassic, and Tertiary formations including Chugwater and Dinwoody Formations, Stump and Preuss sandstone with Twin Creek limestone, Mowry and Thermopolis shales, and Frontier Formation with an elevation range of 7,800 to 9,400 feet. The dominant slope range is 0 to 60 percent. The dominant types of rocks are glacial till, mixed alluvium, sandstone, shale, and limestone. The primary geomorphic processes in these landscapes are glacial and fluvial.

Mean annual precipitation ranges from 40 inches at Green River Lakes to 60 inches at Union Park. Most precipitation occurs in the winter with 30 percent of the precipitation falling as snow. The mean annual air temperature is 34 to less than 32 degrees F.

Streams and the Green River typically occur on the glacial valley floor. The landscape is moderately dissected). Wetlands occur in the along lakes and streams associated with glacial and alluvial deposits. Most lakes occur where glaciers have created depressions or have deposited aterial that traps seasonal runoff.

The primary natural disturbance processes are fire, insects, disease, and mass failures. Human-caused disturbances include logging, rural subdivisions, and recreational trails.

Subsection Ecological Relationships:

This subsection consists of one primary landscape settings. These include glacial valley.

The glacial valley is located on mid elevation sites with dominant slope gradients from 0 to 60 percent. This landscape includes glacial moraines, stream bottoms, alluvial terraces, and mountain sideslopes that are formed in glacial till, mixed alluvium, sandstone, shale, and limestone. The primary soils are 40 to 60 inches deep with sandy loam and loam surface textures with gravelly sandy clay loam subsoils. These soils are classified as Typic Cryoborolls, Mollic Cryoboralfs, and Cumulic Cryaquallos. The dominant potential natural vegetation is subalpine fir/grouse whortleberry, subalpine fir/heartleaf arnica, subalpine fir/western meadowrue, mountain big sagebrush/pubescent wheatgrass, mountain big sagebrush/Idaho fescue, Booth willow riparian community types, and shrubby cinquefoil riparian community types.

Compiled By: Bridger-Teton National Forest, Randy L. Davis

M331Ja Wind River Range Summit

Location: This subsection is located along the continental divide of northwestern Wyoming.

Subsection Concept: This subsection consists of high elevation mountain peaks, ridges, aretes, cols, horns, and cirques of Precambrian Archean granites, gneisses, diorites, granidiorites, and metagabbros that have been modified by periglacial and glacial activity. The major general vegetative types include forb tundra, grassland tundra, and grass-sedge meadows. This map unit is separated from similar subsections based upon steep, high relief slopes, high elevations, alpine vegetation, and harsh cold climates.

Subsection Setting and General Characteristics: These alpine peaks and ridges have an elevation range of 9500 to 13804 feet (2900 to 4200 meters). The dominant slope range is 10 to 60 percent. The dominant types of rocks are Precambrian igneous granites, granidiorites, diorites, quartz diorites, gneisses, and metagabbros. The primary geomorphic processes in these landscapes are glacial, periglacial, and colluvial.

Mean annual precipitation ranges from 35 inches/90 cms on wind swept ridges to 50 inches/127cms in snow depositional areas. Most precipitation occurs in the winter with 50 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 35 degrees F.

Streams typically occur in glacial troughs and cirques as well as below glacier fields. The landscape is highly dissected. Wetlands occur where runoff collects in fens and adjacent small streams. Lakes occur in depressions associated with glaciers and glacial moraines.

The primary natural disturbance processes are frost cracking, avalanches, debris flows, rock topples and rock falls. Human-caused disturbances include trails and camping.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include rugged alpine crests and sideslopes, and glacially scoured cirques and valleys.

The rugged alpine crests and sideslopes are located on high elevation sites with dominant slope gradients greater than 40 percent. These landscapes include nunataks, horns, aretes, cols, scree slopes and talus slopes, glaciers and snowfields that are formed in or on granitic, gneissic, and/or dioritic bedrocks. The primary soils are less than 40 inches deep with loam and sandy loam surface textures. These soils are classified as Dystric Cryochrepts, Lithic Cryochrepts, and Typic Cryumbrepts. The dominant potential natural vegetations are Arctic Willow, Dunhead sedge, false sedge, and Payson sedge.

The glacially scoured cirques and valleys are located on mid and low elevation sites with dominant slope gradients from 10 to 60 percent. These landscapes include glacial troughs, cirques, snow-avalanche chutes, glacial moraines, and avalanche debris fans that are formed in granitic, gneissic, and/or dioritic parent materials. Dominant soils are 20 to 60 inches deep with loam and sandy loam surface textures. These soils are classified as Dystric Cryochrepts, Oxyaquic Cryochrepts, and Typic Cryumbrepts. The dominant potential natural vegetations are tufted hairgrass, plane willow, and elk slip marshmarigold.

Compiled By: Bridger-Teton National Forest, Randy L. Davis and Terry Svalberg

M331Jb Subsummit Uplands

Location: This subsection is located in the Green River basin of northwestern Wyoming.

Subsection Concept: This subsection represents a Tertiary erosion surface and related landforms such as glacial troughs and glaciated mountain sideslopes of the mountain front. Common landforms include knobs, kettles, glacial trough walls and floors, snow-avalanche slopes, talus fields, glacial moraines, and hummocks. Bedrock is dominantly Archean granites, granidiorites, gneisses, and migmatites. The major general vegetative types include coniferous forests, grasslands, riparian types, and tundra. This unit is separated from similar subsections based upon the geomorphologic history of the erosion surface. For example, the dissecting nature of the steep glacial troughs and the surfaces' juxtaposition between high alpine peaks and foothills depict a unique suite of geomorphologic, climatic, and vegetative conditions.

Subsection Setting and General Characteristics: The subsummit uplands have an elevation range of 8000 to 10500 feet/ 2440 to 3200 meters. The dominant slope range is 0 to 50 percent and up to 100 percent in steep glacial troughs. The dominant types of rocks are Precambrian Archean igneous and metamorphic rocks including granite, granidiorite, quartz diorite, diorite, gneiss, granite gneiss, and migmatite. The primary geomorphic processes in these landscapes are residual, glacial, and colluvial.

Mean annual precipitation ranges from 30 inches/76 cms at lower elevations to 40 inches/100 cms at higher elevations. Most precipitation occurs in the winter with 40 percent of the precipitation falling as snow. The mean annual air temperature is 32 to 40 degrees F.

Streams and rivers typically occur in glacial troughs and where meltwater collects below snow and ice fields. The landscape is moderate to highly dissected. Wetlands occur in kettles and fens and are associated with glaciolacustrine deposits. Lakes occur in distal glacial trough locations along the mountain piedmont, and where bedrock fractures and scours trap water on the erosion surface. The primary natural disturbance processes are fire, insects, disease, and wildlife. Human-caused disturbances include fire, camping, trails, outfitting, recreation, and some logging outside of wilderness.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include the glacially dissected subsummit surface, the moderately dissected subsummit surface, glacial troughs, and the mountain front.

The glacially dissected subsummit surface is located in the northern half of the subsection on high elevation sites with dominant slope gradients from 0 to 40 percent. These landscapes include knobs, kettles, hummocks, glaciated mountain slopes, glacial moraines, and glaciated mountain summits. These landforms are typically formed in Archean gneisses and migmatites, granidiorites, and granites. The primary soils are moderately deep (20 to 40 inches) with loam and sandy loam surface textures. These soils are classified as Dystric Cryochrepts, Typic Cryumbrepts, Oxyaquic Cryumbrepts, and Oxyaquic Cryochrepts. The dominant potential natural vegetations are subalpine fir/grouse whortleberry, planer willow, grass-tundra, and forb-tundra.

The moderately dissected subsummit surface is located in the southern half of the subsection on high elevation sites with dominant slope gradients of 0 to 40 percent. These landscapes include knobs, kettles, hummocks, glaciated mountain slopes and glacial moraines that are formed in Archean granites, granidiorites, quartz diorites, quartz monzonites, and gneisses. The primary soils are moderately deep to deep (20 to 60 inches) with sandy loam, loamy sand, and loam surfaces. These soils are classified as Dystric Cryochrepts,

Typic Cryumbrepts, Oxyaquic Cryochrepts, and Oxyaquic Cryumbrepts. The dominant potential natural vegetations are Engelmann Spruce/grouse whortleberry, whitebark pine/grouse whortleberry, planer willow, tufted hairgrass, and Idaho fescue

The glacial troughs dissect primarily the northern half of the subsection and are dominantly very steep sided. These landscapes include avalanche chutes, talus slopes, debris flows, rock slides and lateral moraines along their walls. Along the glacial trough floors are knobs, kettles, hummocks, and recessional moraines which form a stairstep morphology from the heads of the troughs to their terminus. These landforms are formed in or on Precambrian Archean granites, gneisses, migmatites, and diorites. Morainal features are composed of Pleistocene glacial till. The primary soils are moderately deep to deep (20 - 60 inches) with loam and sandy loam surface textures. These soils are classified as Typic Cryorthents, Dystric Cryochrepts and Oxyaquic Cryochrepts. The dominant potential natural vegetations are Englemann spruce/grouse whortleberry, Englemann spruce/ heartleaf arnica, whitebark pine/common juniper, tufted hairgrass, and Wolf willow.

The mountain front landscape is located at lower elevation sites with dominant slope gradients from 0 to 50 percent. These landscapes include knobs, kettles, hummocks, glaciated mountain slopes and glacial moraines that are formed in Precambrian Archean granites, granidiorites, quartz monzonites, and migmatites. The primary soils are moderately deep to deep (20 - 60 inches) with loam, and sandy loam surface textures. These soils are classified as Dystric Cryochrepts, Typic Cryoborolls, Typic Cryoboralfs, and Argic Pachic Cryobolls with loam and sandy loam surface textures. The dominant potential natural vegetations are Englemann spruce/grouse whortleberry, subalpine fir/grouse whortleberry, mountain big sagebrush/slender wheatgrass, and quacking aspen.

Compiled By: Bridger-Teton National Forest, Randy L. Davis and Terry Svalberg

M331Jc Southeastern Wind River Mountains

Location: This subsection is located within the Green River basin of northwestern Wyoming on the southern end of the Wind River Range.

Subsection Concept: This subsection represents glaciated and unglaciated sideslopes and ridges of the western Wind River Mountains, with a transition to the Green River basin at the lower elevations. Common landforms include smooth glacial and glacial fluvial slopes with moderate fluvial dissection on the north end, and smooth undulating slopes formed in residuum with resistant, intrusive dikes, and ridges on the south end. Bedrock on the north end is dominantly Archean granites, granodiorites, schists, and Tertiary sandstones and mudstones. The south end of the subsection is dominated by Tertiary conglomerates, sandstones and claystones. The dominant vegetation include coniferous forests, shrublands, riparian areas, and tundra. This unit is separated from similar subsections based on geomorphic history and the transition from Archean granitics to Tertiary sediments. Because of the transition between high alpine peaks and the Tertiary sediments this subsection depicts a unique set of geomorphic, climatic, and vegetative conditions.

Subsection Setting and General Characteristics: This subsection has an elevation range of 7500 to 10500 feet/ 2280 to 3200 meters. The dominant slope range is 0 to 60 percent. The dominant types of parent materials for soils include Archean granite, granodiorite, quartz diorite, diorite, gneiss, and Tertiary sandstones, claystones and conglomerates. The primary geomorphic processes in these landscapes are residual, glacial, and colluvial.

Mean annual precipitation ranges from 15 inches/38 cms at lower elevations to 35 inches/89 cms at higher elevations. Most precipitation occurs in the winter with 50 percent of the precipitation falling as snow. The mean annual air temperature is 36 to 45 degrees F.

Streams and rivers typically follow historical fluvial dissections with larger riparian areas and wetlands developing where slopes decrease. The landscape is moderately dissected. The primary processes of natural disturbance are fire, insects, disease, and wildlife. Human-caused disturbances include fire, recreation, livestock grazing and some logging outside of wilderness areas.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. The northern portion which has been glaciated and smoothed, and the southern portion which is comprised of residual and colluvial slopes.

The northern portion of the subsection is glacially smoothed with a dominant slope gradient of 0 to 60 percent. This area includes glaciated mountain slopes, glacial moraines, and glaciofluvial deposits. These landforms are typically formed in Archean gneisses and migmatites, granodiorites, and granites with a transition to Tertiary sedimentary sandstones and mudstones to the west. The primary soils are 40 to 60 inches deep with loamy sand and sandy loam surface textures. These soils are classified as Typic Cryochrepts, Typic Cryoborolls and, Oxyaquic Cryochrepts. The potential natural vegetation is subalpine fir/heartleaf arnica, lodgepole pine/heartleaf arnica and mountain big sage/slender wheatgrass.

The southern half of the subsection is comprised of residual and colluvial slopes forming in granitic and sedimentary materials with resistant intrusive dikes of granitic materials. The dominant slope gradient is 0 to 40 percent. These landscapes include residual and colluvial slopes that are formed in Archean granites, granodiorites, quartz diorites and Tertiary sedimentary materials. The dominant soils are 20 to 60 inches deep with loamy sand, and sandy loam surfaces. These soils are classified as Typic Cryochrepts, Typic Cryoborolls and Oxyaquic Cryochrepts. The potential natural vegetations is

lodgepole pine/heartleaf arnica, limber pine/mountain gooseberry, aspen, and
mountain big sagebrush/slender wheatgrass.

Compiled By: Bridger-Teton National Forest, Terry Svalberg and Randy L. Davis

M331Jd Eastern Wind River Mountains

Location: This subsection is located in the Windriver basin of Wyoming.

Subsection Concept: This subsection consists of weakly dissected, hilly, rocky glacial topography composed primarily of granite, granodiorite, and gneiss. The major general vegetative types include coniferous forest with inclusions of shrubland and wetland openings. This map unit is separated from similar subsections based upon elevation, percent of exposed bedrock, and type of coniferous forest.

Subsection Setting and General Characteristics: These have an elevation range of (8000 to 11,000 feet / 2400 to 3250 meters). The dominant slope range is 20 to 40 percent. The dominant types of rocks are granite, granodiorite, and gneiss. The glaciation is the primary geomorphic process in this landscape.

Mean annual precipitation ranges from 20 inches / 51 cms to 40 inches / 102 cms at higher elevations. Most precipitation occurs in the spring and winter seasons with 70 percent of the precipitation falling as snow. The mean annual air temperature is (30 to 35 degrees F / -1 to 2 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes, and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits. Lakes occur in cirque basins and glacial valley bottoms.

The primary natural disturbance processes are fire, insects, disease, and windthrow. Human-caused disturbances include logging, firewood gathering, and tiehacking at the turn of the century.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include non-forested valley bottoms, forested mid elevation glaciated lands, and forested high elevation glaciated lands.

The non-forested valley bottoms are located on mid to high elevation sites with dominant slope gradients from 0 to 5 percent. These landscapes include valley bottom landforms that are formed in alluvium and glacial til. The primary soils are deep and loamy to loamy skeletal. These soils are classified as cryoborolls, cryaquepts, and fibrists. The dominant potential natural vegetation is mountain big sagebrush and various wetland community types.

The forested mid elevation glaciated lands have dominant slope gradients from 20 to 50 percent. These landscapes include glaciated landforms that are formed in granitic glacial til. The primary soils are deep and have sandy skeletal textures. These soils are classified as cryochrepts. The dominant potential natural vegetation is a combination of a subalpine fir plant associations and lodgepole pine community types.

The forested high elevation glaciated lands have dominant slope gradients from 20 to 50 percent. These landscapes include scoured glaciated landforms that are formed in granitic parent material. The primary soils are moderately deep and have sandy skeletal textures. These soils are classified as cryochrepts. Rock outcrop is a major component in the landscape. The dominant potential natural vegetation is a combination of a subalpine fir and whitebark pine plant associations.

Compiled By: USFS, Kent E. Houston and Jerry Freeouf

M331Je Wind River Sedimentary Mountains

Location: This subsection is located in the Windriver river basin of Wyoming.

Subsection Concept: This subsection consists of strongly dipping sedimentary formations that have been modified by fluvial and residual erosion processes. The major general vegetative types include coniferous forest, grasslands, and shrublands. This map unit is separated from similar subsections based upon strongly dipping calcarious sedimentary formations and a coniferous forest zone dominated primarily by inland Douglas fir.

Subsection Setting and General Characteristics: These Sedimentary Fluvial Lands have an elevation range of (7,000 to 11,500 feet / 2100 to 3500 meters. The dominant slope range is 20 to 40 percent. The dominant types of rocks are limestone with lesser amounts of shale, claystone, and sandstone. The primary geomorphic processes in these landscapes are fluvial and residual erosion.

Mean annual precipitation ranges from 15 inches / 38 cms at lower elevations to 20 inches / 51 cms) at mountain tops. Most precipitation occurs in the winter and spring months with sixty five percent of the precipitation falling as snow. The mean annual air temperature is 30 to 40 degrees F/ 1 to 4 degrees C.

The characteristic surface water features associated with this subsection include streams and rivers associated with a moderately dissected landscape. Wetlands occur along drainage bottoms associated with alluvial deposits.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include firewood gathering, logging, and tiehack activities around the turn of the century.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include forested uplands and grass and shrubland dominated uplands.

Douglas-fir uplands are located on mid elevation sites with dominant slope gradients from (20 to 40 percent). These landscapes include scarp faces adjacent to dipping sedimentary landforms that are formed in primarily calcarious residual parent materials. The primary soils are deep with loamy textures. These soils are classified as cryoborolls, cryochrepts, and cryoboralfs. The dominant potential natural vegetation is Douglas fir with inclusions of limber pine.

Grass and Shrub dominated uplands are located on mid to high elevation sites with dominant slope gradients from (20 to 40 percent). These landscapes include dipping sedimentary landforms that are formed primarily in residual calcarious parent materials. The primary soils are moderate to deep with loamy textures. These soils are classified as cryoborolls and cryochrepts. The potential natural vegetation is dominated by Idaho fescue grasslands and shrublands consisting primarily of mountain big sagebrush.

Compiled By: USFS, Kent E. Houston and Jerry Freeouf

M332Aa Lochsa Canyon Breaklands

Location: This subsection is located on the lower reaches of the Lochsa and Selway Rivers, in the Clearwater River basin, in north central Idaho.

Subsection Concept: This subsection consists of highly dissected and entrenched stream breaklands that have been shaped by stream downcutting and erosion, including mass wasting and surface erosion. This map unit is separated from similar canyonlands based upon bedrock lithology.

Subsection Setting and General Characteristics: These breaklands have an elevation range of 1400 to 5000 feet (420 to 1500 m). The slope range is 40 to more than 80 percent, except for included alluvial terraces and floodplains, which have slopes of 1 to 30 percent. The dominant lithology is moderately well weathered Precambrian schist, and quartz monzonite of the Idaho Batholith. The primary geomorphic processes are fluvial downcutting of uplifted mountains, with mass wasting, especially debris torrents and slumping.

Mean annual precipitation ranges from 36 to 60 inches (91 to 152 cm). Most precipitation occurs in the winter and spring months. About 60 percent falls as snow above about 4000 feet, while more falls as rain below this elevation. The mean annual air temperature is from 39 to 49 degrees F (4 to 9 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, and wetlands. Typically the landscape is highly dissected with low order surface streams, which are high gradient and transport water and sediment rapidly to large order lower gradient streams and the rivers. Wetlands occur in valley bottom locations associated with larger order streams. Wetlands are a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease infestations, and debris torrents and slumping. Natural fire regime at low elevations is of moderate to high frequency and low to mixed severity, and moderate to large extent. Fire regime at mid and upper elevations is of low to moderate frequency, mixed to high severity and moderate to large extent. Rain on snow, spring snowmelt, or summer thunderstorms can initiate debris torrents, especially when post-fire conditions leave slopes more vulnerable. Colluviation also adds material to lower slope positions and fluvial activity transports material to large order, moderate gradient stream reaches.

In the absence of fire, root rot pathogens are the primary agent of plant community diversity in this landscape.

Road building and fire suppression have altered disturbance regimes and erosion rates. Road building and facility development along the River corridors, and introduction of exotic plants along the corridors have altered plant community composition in these areas, and affected coastal disjunct habitat. Human-caused disturbances include residential development in the valley bottoms and timber harvest and road building on the sideslopes.

Subsection Ecological Relationships: This subsection includes two primary landscape settings.

The valley bottoms are located along low elevation sites on major rivers and streams. They consist of alluvial fans, floodplains, and terraces. They are formed in stratified fluvial deposits of gravels, sands, or silts, including some loess. The primary soils are very deep loams, silt loams, and gravelly cobbly sands. These soils are classified as Typic Xerofluvents and Udivitridands. The dominant potential natural vegetation is Douglas-fir series on dry sites and western red cedar on moist sites. This component is a minor amount of the subsection.

Stream breaklands are located on sideslopes. Soils have formed in residual

and colluvial material, and volcanic ash influenced loess. Primary soils are deep and very deep silt loams and loams. These soils are classified as Typic Udivitrands on north slopes and Typic Dystrochrepts and Typic Haplumbrepts on south aspects. The dominant potential natural vegetation is grand fir and western red cedar series.

Compiled by: Clearwater NF, Dale Wilson

M332Ab Freezeout Mountain Glaciated Lands

Location: This subsection is located in the headlands of the Lochsa and lower Selway River basins, in north central Idaho.

Subsection Concept: This subsection consists of alpine glaciated ridges and slopes with fluvial headcutting of downriver canyons and cryoplanated ridges. Subalpine and mesic coniferous forests dominate the landscapes. This map unit is separated from similar dissected glaciated lands by potential vegetation and soils.

Subsection Setting and General Characteristics: These dissected glaciated lands have an elevation range of 5000 to 7500 feet (1500 and 2250 m). The slope range is 5 to more than 80 percent. The dominant lithology is quartz monzonite and gneiss associated with the Idaho Batholith. The primary geomorphic processes in these landscapes are glacial and fluvial erosion, and cryoturbation.

Mean annual precipitation ranges from about 45 to 70 inches (114 to 178 cm). Most precipitation occurs in the winter and spring months as snow. The mean annual air temperature is from 31 to 39 degrees F (0 to 4 degrees C).

The characteristic surface water features associated with this subsection include streams, lakes, wetlands, and rivers. Typically the landscape is moderately dissected with surface streams and rivers. Wetlands occur in glacial trough bottoms and as seeps and springs on sideslopes. Lakes occur in cirque basins and glacial valley bottoms. Wetlands and lakes are a small but important component of this subsection. Low order streams are usually poorly entrenched on glacial trough walls. They are high gradient and transport water and sediment rapidly to larger order streams. Larger streams in glacial valley bottoms have low to high gradient reaches in complex sequences.

Primary natural disturbance processes are wildfire, insect and disease epidemics, and climatic events that cause debris torrents and avalanches. Natural fire regime in well drained areas is of low to moderate frequency, mixed to high severity, and moderate to large extent. Fire regime in trough bottoms is of moderate to low frequency, low to mixed severity and moderate extent.

Debris torrents and debris avalanches associated with stream channels and unconsolidated till deposits shape channels and sideslopes. Snowmelt, rain on snow events, and summer thunderstorms may all contribute to these processes. Colluviation also adds material to lower slope positions and fluvial activity sorts and redeposits valley fill. Human-caused disturbances have been slight except for fire suppression. This subsection is mostly roadless. Substrata are highly to very highly erodible but the slight history of development has little increased levels of sediment in streams above levels associated with natural disturbance regimes.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include alpine glaciated slopes, valley bottoms, and cryoplanated slopes.

Alpine glaciated slopes are in valley headlands, mostly on north and east aspects. Slopes are 20 to more than 80 percent. These landscapes include glacial cirques, trough walls, and moraines. Soils are formed in weakly weathered bedrock, glacial till and loess. Rock outcrop is common. The primary soils are shallow to deep loams and gravelly sandy loams. These soils are classified as Dystric Cryochrepts and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir and grand fir series, and herbaceous and shrub complexes on exposed ridges and in depressions.

Glacial valley bottoms are in cirque basins and glacial trough bottoms, with slopes of 1 to 30 percent. Soils are formed in both unsorted and reworked glacial-fluvial material. High water tables occur in depressions. The primary soils are deep and very deep silt loams and loams. These soils are classified as Typic Vitricryands, and Humic Cryaquepts. The dominant potential natural vegetation is subalpine fir series, and meadow and shrub complexes in wet areas.

Uplands are located on south and west aspects, with slopes of 10 to 50 percent. These landscapes include cryoplanated slopes and ridges, formed in residual material, with inclusions of glacial till. The primary soils are deep gravelly silt and sandy loams. These soils are classified as Typic Fulvicryands, Typic Vitricryands, Andic Cryochrepts, and Dystric Cryochrepts. The dominant potential natural vegetation is subalpine fir, grand fir, and western red cedar series, and herbaceous and shrub complexes on exposed ridges and in depressions.

Compiled by: Nez Perce NF, P. Green

M332Ad Elk Summit Basin

Location: This subsection is located in the upper Lochsa River Basin in north central Idaho.

Subsection concept: This subsection consists of basins, broad ridges and vallies shaped by scour and flowage of a large alpine icecap. Low relief ridges are scoured with deposits of well drained glacial tills. Draws and swales contain poorly drained compacted glacial tills. Granitics of the Idaho Batholith occupy 80% of the subsection. The remainder, primarily in the northern and eastern portions is formed in calc-silicate gniesses of the Wallace Formation. Higher elevation ridges were subsequently scoured by alpine glaciation. The subsection has a maritime influenced climate and subalpine forest types.

Subsection Setting and General Characteristics: Elevations range between 4500 and 7000 feet (1375 to 2150 m.). Slope gradients range from 10 to 60+ percent. The subsection has three dominate landforms. Large alpine icecaps formed gentle low relief basins with moderate density structurally controled drainage patterns and elevations between 5000 and 6300 feet (1525 and 1920 m.). Slope gradients range 10 to 40 percent. Ridges are well drained while draws and swales are commonly poorly drained wetlands. Broad troughs shaped by flowage from the icecaps contain major drainages dissecting the scoured upland basins and have elevations between 4500 and 6500 feet (1375 to 1975 m.). Alpine glaciated headlands occur on higher ridges (6000 to 7000feet, 1825 to 2150 m.) in and adjacent to the scoured basins. Dominent geomorphic processes these landscapes are glaciation and frostchurning with limited susequent fluvial action.

Mean annual precipitation ranges from 45 to 80+ inches (114 to 200+cm). Most precipitation occurs during the winter and spring months as snow. The mean annual temperature is from 31 to 39 degrees F (0 to 4 degrees C).

Surface waters consist of streams, glacial lakes and wetlands. Wetlands are associated with glacial trough bottoms and compacted glacial tills. The pattern and distribution of wetlands associated with the compacted tills is a key ecological characteristic of this subsection.

The primary natural distrubances are wildfire, insect and disease infestations. Fire regimes on well drained ridges is moderate frequency, mixed to high severity and moderate to large in extent. Fire regimes in the compacted tills are low frequency, mixed severity and small to moderate in extent.

Soils are coarse textured, skeletal moderate to deep, glacial tills with a loessial volcanic ashcap and are classified as Aquands, Cryands and Cryochrepts. Subalpine fir vegetative series occupies the entire subsection.

Compiled by: Clearwater National Forest: D.Wilson

M332Ae Hunter Peak Glaciated Mountains

Location: This subsection is located in the upper Selway River drainage in north central Idaho.

Subsection Concept: This subsection consists of glaciated mountains of Cretaceous granites that have been modified by subsequent colluviation, fluvial entrenchment of streams and sorting of valley fill. Cryoplanation has also affected upper elevation ridges. Subalpine and mesic forests dominate the landscape. This map unit is separated from similar glaciated mountains based upon bedrock lithology and climate.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 4000 to 8500 feet (1200 to 2550 m). The slope range is 2 to more than 80 percent. The dominant lithology is weakly to moderately weathered quartz monzonite. The primary geomorphic processes in these landscapes are glacial and fluvial erosion.

Mean annual precipitation ranges from 35 inches (89 cm) in the valley bottoms to 60 inches (152 cm) at the mountain tops. Most precipitation occurs in the winter and spring months as snow. The mean annual air temperature is from 28 to 43 degrees F (-2 to 6 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately dissected with surface streams and rivers. Wetlands occur in the valley bottom locations associated with glacial-fluvial and alluvial deposits. Lakes occur in cirque basins and glacial valley bottoms. Wetlands and lakes are a small component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and climatic events that cause debris torrents and avalanches. Natural fire regime in well drained areas is of low to moderate frequency, mixed to high severity and moderate to large extent. Insect activity contributes to tree mortality and fuel accumulations. Fire regime in valley bottoms is of moderate to low frequency, low to mixed severity, and moderate extent.

Debris torrents and debris avalanches associated with stream channels and unconsolidated till deposits shape channels and sidelopes. Snowmelt and summer thunderstorms may both contribute to these processes. Colluviation also adds material to lower slope positions and fluvial activity sorts and redeposits valley fill. Human-caused disturbances have been slight except for fire suppression. This subsection is roadless. Substrata are very highly erodible, but the slight history of development has little increased levels of sediment in streams above levels associated with natural disturbance regimes.

Subsection Ecological Relationships:

This subsection has a repeating pattern of glacial troughs originating in glacial cirques formed in the ridges along the Idaho-Montana border and westward trending valleys.

Glacial valley bottoms are in cirque basins and glacial trough bottoms, with slopes of 1 to 30 percent. Soils are formed in both unsorted and reworked glacial-fluvial material and volcanic ash influenced loess. High water tables occur in depressions. The primary soils are deep and very deep loams and sandy loams. These soils are classified as Typic Cryumbrepts, Andic and Dystric Cryochrepts, and Humic Cryaquepts. The dominant potential natural vegetation is subalpine fir series, and meadow and shrub communities in wet areas.

Alpine glaciated slopes are in valley headlands and concave walls of valleys. These landscapes include cirques, trough walls, and moraines. Soils are

formed in weakly weathered material and rock outcrop is common. The primary soils are shallow to deep gravelly sandy loams. These soils are classified as Dystric Cryochrepts. The dominant potential natural vegetation is subalpine fir and grand fir series, and whitebark pine and subalpine larch on high elevation ridges.

Compiled by: Nez Perce NF, Pat Green

M332Af Copper Butte Glaciated Lands

Location: This subsection is located in the Selway River basin of north central Idaho.

Subsection Concept: This subsection consists of glaciated ridges and slopes with fluvial headcutting of downriver canyons. Subalpine and mesic coniferous forests dominate the landscapes. This map unit is separated from similar dissected glaciated lands by potential vegetation and soils.

Subsection Setting and General Characteristics: These dissected glaciated lands have an elevation range of 4500 to 7000 feet (1350 to 2100 m). The slope range is 20 to more than 80 percent. The dominant lithology is Precambrian gneiss and quartz monzonite associated with the Idaho batholith. The primary geomorphic processes in these landscapes are glacial and fluvial erosion.

Mean annual precipitation ranges from about 35 to 50 inches (89 to 127 cm). Most precipitation occurs in the winter and spring months as snow. The mean annual air temperature is from 33 to 40 degrees F (1 to 4 degrees C).

The characteristic surface water features associated with this subsection include streams, lakes, wetlands, and rivers. Typically the landscape is moderately dissected with surface streams and rivers. Wetlands occur in glacial trough bottoms and as seeps and springs on sideslopes. Lakes occur in cirque basins. Wetlands and streams are a small component of this subsection. Low order streams are usually poorly entrenched on glacial trough walls. They are high gradient and transport water and sediment rapidly to larger order streams. Larger streams in glacial trough bottoms have low to high gradients in complex sequences.

Primary natural disturbance processes are wildfire, insect and disease epidemics, and climatic events that cause debris torrents and avalanches. Natural fire regime in well drained areas is of low to moderate frequency, mixed to high severity, and moderate extent. Fire regime in trough bottoms is of moderate to low frequency, low to mixed severity and small to moderate extent.

Debris torrents and debris avalanches associated with stream channels and unconsolidated till deposits shape channels and sideslopes. Snowmelt and summer thunderstorms may both contribute to these processes. Colluviation also adds material to lower slope positions and fluvial activity sorts and redeposits valley fill. Human-caused disturbances have been slight except for fire suppression. This subsection is roadless. Substrata are highly erodible but the slight history of development has little increased levels of sediment in streams above levels associated with natural disturbance regimes.

Subsection Ecological Relationships:

This subsection has a repeating pattern of alpine glaciated slopes and valley bottoms. Alpine glaciated slopes are in valley headlands. Slopes are 20 to more than 80 percent. These landscapes include glacial cirques, trough walls, and moraines. Soils are formed in weakly weathered residual material glacial till and volcanic ash influenced loess. Rock outcrop is common. The primary soils are shallow to deep loams and sandy loams. These soils are classified as Andic Cryochrepts and Dystric Cryochrepts. The dominant potential vegetation is subalpine fir, grand fir, and whitebark pine series on sideslopes and herbaceous and low shrub complexes on exposed ridges.

Glacial valley bottoms are in cirque basins and glacial trough bottoms, with slopes of 1 to 30 percent. Soils are formed in both unsorted and reworked glacial-fluvial material. High water tables occur in depressions. The primary soils are deep and very deep loams and sandy loams. These soils are classified as Typic Cryumbrepts and Humic Cryaquepts. The dominant potential natural vegetation is grand fir and subalpine fir series, and meadow and shrub

complexes in wet areas.

Compiled by: Nez Perce NF, Pat Green

M332Ag Selway Uplands

Location: This subsection is located in the Selway River Basin of north central Idaho.

Subsection Concept: This subsection consists of a strongly dissected peneplain surface, entrenched and downcut, in a zone of maritime climatic influence. Mesic and subalpine forests dominate the landscapes. This map unit is separated from similar dissected lands by potential vegetation and soils.

Subsection Setting and General Characteristics: These dissected lands have an elevation range of 2500 to 7000 feet (750 to 2100 m). The slope range is 30 to 60 percent. The dominant lithology is Precambrian schist, gneiss, and quartzite. The primary geomorphic processes in these landscapes are strong fluvial action with debris torrents shaping channels and colluviation shaping slopes.

Mean annual precipitation ranges from 35 inches (89 cm) in the valley bottoms to 60 inches (152 cm) at the mountain tops. Most precipitation occurs in the winter and spring as snow above about 4000 feet and as rain below this elevation. The mean annual air temperature is from 33 to 46 degrees F (1 to 8 degrees C).

The characteristic surface water features associated with this subsection include streams, and wetlands. Typically the landscape is highly dissected with low order surface streams. Wetlands occur in valley bottoms of larger order streams and in depressions on sideslopes. Wetlands represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease activity, and windthrow. The natural fire regime is one of low to moderate frequency, moderate to high severity and moderate to large extent. More frequent fires on ridges are usually of low severity. Mass movement on steep slopes is associated with post fire conditions and rain on snow or rapid snowmelt. Debris torrents in high gradient low order channels and slump earthflows on saturated lower slopes are the dominant mass wasting processes. Substrata are highly erodible. Fire suppression may have altered plant community composition from historic patterns through advancement of succession, alteration of subsequent fire behavior, and increased pathogen activity. Road building has altered sediment regimes from historic patterns.

Subsection Ecological Relationships:

This subsection consists of uplands including rolling hills, colluvial slopes and convex ridges, with minor inclusions of weakly glaciated slopes. Soils have formed in well weathered gneiss, schist, and granite. The primary soils are deep and very deep silt loams and loams. These soils are classified as Typic Fulvicryands, Typic Haplocryands, and Typic and Humic Udivitrands. The dominant potential natural vegetation is western red cedar, grand fir, and subalpine fir series.

Compiled by: Nez Perce NF, Pat Green

M332Ah Lower South Fork Clearwater Uplands

Location: This subsection is located in the South Fork of the Clearwater River basin in north central Idaho.

Subsection Concept: This subsection consists of a strongly dissected peneplain surface, entrenched and downcut, in a zone of climatic influence transitional from maritime to montane. Geology is Precambrian and Cretaceous igneous and metamorphic rock. Mesic and subalpine coniferous forests dominate the landscapes. This map unit is separated from similar dissected uplands by climate and rock weathering.

Subsection Setting and General Characteristics: These dissected uplands have an elevation range of 2500 to 8000 feet (750 to 2400 m). The slope range is 5 to 80 percent. The dominant lithology is Precambrian and Cretaceous igneous and metamorphic schist, granite, quartzite, and biotite gneiss. The primary geomorphic processes in these landscapes are strong fluvial action and colluviation, with debris torrents, surface erosion and slump earthflows shaping channels where entrenched channels abut rounded ridge remnants of the old surface.

Mean annual precipitation is 25 inches (64 cm) in the valley bottoms to 45 inches (114 cm) on the highest ridges. Most precipitation occurs in the winter and spring months. Above about 4000 feet elevation, much of the precipitation falls as snow. The mean annual air temperature ranges from 32 to 49 degrees F (0 to 9 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately dissected with surface streams and rivers. Wetlands occur in stream headlands. Lakes occur in cirque basins. Wetlands and lakes represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and mass movement. Natural fire regime at low elevations is of high to moderate frequency and low to mixed severity and moderate extent. At mid elevations fire regimes are of moderate frequency, mixed to high severity and moderate to large extent. At high elevations fire regimes are of moderate to low frequency, mixed to high severity and moderate to large extent.

Areas of steep slopes and complex lithology are most prone to mass wasting. Debris torrents occur on low order streams in steep terrain, and debris avalanches and bedrock slides occur with channel downcutting along major streams. Slump earthflows occur in areas of high water tables. Fire suppression has altered plant community composition, pathogen activity, and fuel loadings. Mining and road building have altered erosion rates and sediment regimes from historic levels.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include stream breaklands and colluvial slopes, uplands, and alpine landscapes.

The breaklands and colluvial slopes are at low to mid elevations along streams and rivers. Slopes are 45 to 80 percent. The soils are formed in moderately well weathered residual and colluvial material. The primary soils are shallow to very deep loams and sandy loams. These soils are classified as Typic Dystrochrepts, Ultic Haploxerolls, and Andic Dystrochrepts. The dominant potential natural vegetation is Douglas-fir and grand fir series.

Uplands are at mid to high elevations, with slopes from 10 to 50 percent. These landscapes include rolling hills and convex slopes and broadly convex ridges. The soils are formed in moderately well weathered residual material and volcanic ash influenced loess. The primary soils are deep and very deep

silt loams, loams, and sandy loams. These soils are classified as Andic Cryochrepts, Typic Vitricryands, Typic Fulvicryands, and Andic Dystrochrepts. The dominant potential natural vegetation is grand fir and subalpine fir series.

The alpine landscapes are located on upper elevation sites. Cirque walls and glacial trough walls have slopes of 30 to more than 70 percent. They are formed in residual bedrock, glacial till, and volcanic ash influenced loess. Included glacial valley bottoms and cirque basins have slopes of 2 to 40 percent. Soils are formed in glacial till, outwash, and volcanic ash influenced loess. The primary soils on glaciated slopes are shallow to deep silt loams, loams, and gravelly sandy loams. These soils are classified as Typic Vitricryands, Dystric Cryochrepts, and Andic Cryochrepts. Soils in glacial valley bottoms are deep silt loams, loams and sandy loams. These soils are classified as Typic Fulvicryands, Andic Cryochrepts, Andic Cryumbrepts, and Humic Cryaquepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series. Meadows and shrub complexes occur in valley bottoms.

Compiled by: Nez Perce NF, Pat Green

M332Ai Elk City Uplands

Location: This subsection is located in the upper reaches of the South Fork Clearwater River basin in north central Idaho.

Subsection Concept: This subsection consists of a moderately dissected peneplain surface, entrenched and downcut, in a zone of climatic influence transitional from maritime to montane, with cold air impoundment in valley bottoms. Lithology is Precambrian metamorphic rock and Tertiary sediments. Subalpine and mesic coniferous forests dominate the landscape. This map unit is separated from similar dissected uplands by bedrock lithology and climate.

Subsection Setting and General Characteristics: These dissected uplands have an elevation range of 3500 to 8000 feet (1050 to 2400 m). The slope range is 2 to 70 percent. The dominant lithology is Precambrian gneiss and schist and Tertiary sediments. The primary geomorphic processes in these landscapes are fluvial erosion and minor alpine glaciation.

Mean annual precipitation is from 30 inches (76 cm) in the valley bottoms to 50 inches (127 cm) at the mountain tops. Most precipitation occurs in the winter and spring months. Much of the precipitation falls as snow above about 4500 feet elevation. The mean annual air temperature ranges from 29 to 42 degrees F (-2 to 6 degrees C).

The characteristic surface water features associated with this subsection include streams, river, lakes, and wetlands. Typically the landscape is moderately dissected with surface streams and rivers. Low order streams are often high gradient and high order streams are low to moderate gradient. Wetlands occur in valley bottom locations associated with low gradient stream reaches, or in drainage headlands. Lakes occur in cirque basins. Lakes and wetlands are a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease activity, and windthrow. Natural fire regime is of moderate frequency, mixed to high severity and moderate to large extent. Mass wasting in response to climatic and fire disturbances is relatively minor. Highly erodible soil substrata and low to moderate transport capacity of streams make this subsection sensitive to sedimentation.

Road building and mining have altered sediment regimes. Fire suppression has altered plant community composition and pathogen activity.

Subsection Ecological Relationships:

This subsection has a repeating pattern of two primary landscape settings. These include uplands and alpine landscapes.

The uplands are located at low to mid elevation sites with slopes from 10 to 60 percent. These landscapes include rolling hills, colluvial slopes, convex slopes and ridges, and minor inclusions of stream breaklands. Soils are formed in moderately well weathered residual and colluvial material and volcanic ash influenced loess. The primary soils are deep silt loams, loams, and sandy loams. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, Typic Dystrochrepts, and Typic Vitricryands. The dominant potential natural vegetation is grand fir and subalpine fir series.

The alpine landscapes are located at mid to high elevation sites, with the dominant slopes from 30 to 80 percent. These landscapes include glacial cirques, trough walls, and moraines. Included are minor cirque basins and trough bottoms with gentler slopes and deeper soils. Soils form in residual bedrock, glacial till and volcanic ash influenced loess. The primary soils are shallow to deep silt loams, loams, and gravelly sandy loams. These soils are classified as Typic Cryumbrepts, Typic Vitricryands, Andic Dystrochrepts, and Dystric Cryochrepts. The dominant potential natural vegetation is

subalpine fir series.

Compiled by: Nez Perce NF, Pat Green

M332Aj Florence Basin

Location: This subsection is located in the Salmon River basin in north central Idaho.

Subsection Concept: This subsection consists of a highly eroded uplifted basin, densely dissected, in a zone of montane climatic influence with cold air impoundment. Subalpine and mesic coniferous forests dominate the landscapes. This map unit is separated from similar dissected basins based upon dissection and bedrock lithology.

Subsection Setting and General Characteristics: This dissected basin has an elevation range of 3000 to 8000 feet (900 to 2400 m). The slope range is 1 to more than 80 percent. The dominant lithology is Cretaceous granodiorite. The primary geomorphic processes in these landscapes are glacial and fluvial erosion.

Mean annual precipitation ranges from 30 to 45 inches (76 to 114 cm). Most precipitation occurs in the winter and spring months. Most falls as snow above about 4500 feet. The mean annual air temperature is from 29 to 44 degrees F (-2 to 7 degrees C).

The characteristic surface water features associated with this subsection include streams, lakes and wetlands. Typically the landscape is highly dissected in the foothills and moderately dissected in the alpine glaciated mountains with surface streams. Wetlands occur in the valley bottom locations associated with low gradient stream reaches, in glacial-fluvial and alluvial deposits. Lakes are in glacial cirque basins. Wetlands are a significant component of this subsection, while lakes are a minor component.

The primary natural disturbance processes are wildfire, insect and disease epidemics, surface erosion and valley infilling. Mass erosion plays a relatively small role. Natural fire regime at low and mid elevations is moderate frequency and mixed to high severity, and moderate to large extent. At high elevations, fire frequency is lower. Erosion and sedimentation due to activities that expose the very highly erodible substrata (mining and road building) have produced high sediment loads in streams at mid to low elevations since the beginning of mining in the 1860's.

Subsection Ecological Relationships:

This subsection consists of two primary landscapes. These include a central basin of dissected uplands and a high elevation rim of glaciated slopes on the east and west borders.

The basin is at low to mid elevations with slopes of 1 to 50 percent. These landscapes include rolling hills, alluvial valley bottoms, and colluvial slopes. Soils are formed in residual, alluvial or colluvial material, and volcanic ash influenced loess. The primary soils are moderately deep to very deep loams and sandy loams. These soils are classified as Andic Dystrichrepts, Andic Cryochrepts and Humic Cryaquepts. The dominant potential natural vegetation is grand fir and subalpine fir series, and sedge meadow communities.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 10 to 100 percent. These landscapes include glacial cirques, glacial troughs, alpine ridges and moraines. They are formed in residual bedrock, glacial till, and glacial-fluvial deposits, with volcanic ash influenced soil surface layers on slopes less than about 45 percent. The primary soils are shallow to deep Andic and Dystric Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series.

Compiled by: Nez Perce NF, Pat Green

M332Ak Gospel Peak Glaciated Mountains

Location: This subsection is located along the watershed divide between the Salmon River and South Fork Clearwater River basins in north central Idaho.

Subsection Concept: This subsection consists of glaciated mountains of Cretaceous and Precambrian bedrock. Moderate glaciation has shaped the landforms, with subsequent colluviation and glacial-fluvial sorting of material in valley bottoms. Broad ridges have been ice scoured, and downriver canyons have been head cut by fluvial action. Mesic and subalpine coniferous forests dominate the landscapes. This map unit is separated from similar glaciated mountains based upon bedrock lithology.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 4000 to 8500 feet (1200 to 2550 m). The slope range is 10 to more than 100 percent. The dominant lithology is Precambrian quartzite and Cretaceous granite. The primary geomorphic processes in these landscapes are glacial and fluvial erosion.

Mean annual precipitation ranges from 35 inches (89 cm) at low elevations to 50 inches (127 cm) at upper elevations. Most precipitation occurs in the winter and spring. A high percentage falls as snow. The mean annual air temperature is from 29 to 43 degrees F (-2 to 6 degrees C).

The characteristic surface water features associated with this subsection include streams, lakes, and wetlands. Typically, the landscape is moderately dissected with surface streams. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits. Lakes occur in cirque basins. Wetlands and lakes represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and mass erosion associated with snow or debris avalanches. Natural fire regime at low elevations is of moderate frequency, mixed severity, and moderate extent. Fire regime at high elevations is of lower frequency. Debris torrents and debris avalanches associated with stream channels and unconsolidated till deposits on steep headwalls shape channels and sideslopes. Colluviation also adds material to lower slope positions and fluvial activity sorts and redeposits valley fill. This subsection is mostly roadless. Human-caused disturbances include mining exploration and fire suppression. Mining development may have increased levels of sediment in some streams above levels associated with natural disturbance regimes. Fire suppression has probably altered plant community composition.

Subsection Ecological Relationships:

This subsection consists primarily of ridges with glacial cirques and troughs originating on north and east aspects. Breaklands are along lower elevation canyons.

Glacial cirques and troughs are at high elevations and include ice scoured ridges where soils are shallow, and areas of cryoplanation, with deeper soils. Dominant slopes are from 40 to more than 100 percent, with larger valley bottoms having slopes of 2 to more than 20 percent. Rock outcrop is common. Soils on glaciated slopes are shallow to deep silt loams, loams, and gravelly sandy loams. They are formed in residual material, glacial till and volcanic ash influenced loess. These soils are classified as Andic, Lithic, and Dystric Cryochrepts. Soils in valley bottoms are formed in glacial-fluvial and alluvial deposits. They are deep to very deep silt loams, loams, and sandy loams. These soils are classified as Typic Fulvicryands, Humic Cryaquepts, and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series, alpine shrub and forb communities on exposed ridges and sedge or shrub complexes along low gradient stream reaches in valley bottoms.

Breaklands and colluvial slopes are at low and mid elevations and have slopes of 45 percent or more. Soils have formed in residual or colluvial material and volcanic ash influenced loess. Soils are shallow to deep loams and sandy loams. These soils are classified as Dystric Cryochrepts, Typic Dystrochrepts, Andic Dystrochrepts, and Ultic Haploxerolls. The dominant potential natural vegetation is grand fir and subalpine fir series. Douglas-fir series are on low elevation southerly aspects.

Compiled by: Nez Perce NF, Pat Green

M332A1 Red River-Chamberlin Basins

Location: The two delineations of this subsection are located in the Salmon River and South Fork Clearwater River basins in north central Idaho.

Subsection Concept: This subsection consists of moderately dissected upland basins, uplifted and eroded, in Cretaceous igneous rock and Precambrian metamorphics. These are in a zone of montane climatic influence with cold air impoundment in valley bottoms. Subalpine and mesic forests dominate the landscapes. This map unit is separated from similar uplifted basins based upon bedrock lithology.

Subsection Setting and General Characteristics: These basins have an elevation range of 3000 to 7500 feet (900 to 2250 m). The slope range is 2 to 60 percent. The dominant lithology is granite of the Idaho batholith and Precambrian gneiss and quartzite. The primary geomorphic process in these landscapes is fluvial erosion.

Mean annual precipitation ranges from 30 inches (76 cm) at low elevations to 45 inches (114 cm) at high elevations. Most precipitation occurs in the winter and spring months. Most falls as snow above about 4500 feet. The mean annual air temperature is from 32 to 45 degrees F

The characteristic surface water features associated with this subsection include streams, rivers, lakes, and wetlands. Typically, the landscape is moderately to highly dissected with surface streams and rivers. Wetlands occur along low gradient depositional reaches in both alluvial and glacial-fluvial settings. Lakes occur in glacial cirque basins at high elevations. Lakes are a minor component of this subsection.

The primary natural disturbance processes include wildfire and insect and disease epidemics. Natural fire regime is of moderate to low frequency, mixed to high severity and moderate to large extent. Mass erosion plays a relatively small role except in steep alpine glaciated settings. Surface erosion and valley infilling are the primary geomorphic disturbance agents. Erosion and sedimentation due to activities that expose the highly erodible substrate (mining and road building) have produced high sediment loads since the beginning of mining in the 1860's in the Red River basin. The Chamberlin Basin is in wilderness and has experienced much less human-caused disturbance. Fire suppression has probably altered plant community composition, insect and disease activity, and recent fire behavior.

Subsection Ecological Relationships:

This subsection consists of two primary landscapes. These include a central basin of dissected uplands and intermingled areas of glaciated slopes.

The basin is at low to mid elevations with slopes of 1 to 50 percent. These landscapes include rolling hills, alluvial valley bottoms, and colluvial slopes. Soils are formed in residual, alluvial or colluvial moderately well weathered granite or gneiss, with surface layers of volcanic ash influenced loess. The primary soils are moderately deep to very deep loams and sandy loams. These soils are classified as Andic Dystrochrepts, Andic Cryochrepts and Humic Cryaquepts. The dominant potential natural vegetation is grand fir and subalpine fir series, and sedge meadow communities.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 10 to 100 percent. These landscapes include glacial cirques, glacial troughs, alpine ridges and moraines. They are formed in residual bedrock, glacial till, and glacial-fluvial deposits, with volcanic ash influenced soil surface layers on slopes less than about 45 percent. The primary soils are shallow to deep Andic and Dystric Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series.

Compiled by: Nez Perce NF, Pat Green

M332Am Magruder Glaciated Uplands

Location: This subsection is located in the Selway River Basin of the northern part of Idaho.

Subsection Concept: This subsection consists of mountain slopes having granitic and calcium bearing precambrian belt bedrock that have been modified by glaciation and stream dissection. The major general vegetative types include subalpine and montane coniferous forests and grasslands. This map unit is separated from similar glaciated subsections based upon the presence of calcic rock types.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 3000 to 8500 feet (915 to 2590 meters). The dominant slope range is 60 to 80 percent. The dominant types of rocks are moderately to highly weathered quartz monzonite, calc-silicate, and gneiss. The primary geomorphic processes in these landscapes are glaciation and stream erosion.

Mean annual precipitation ranges from (35 inches/89 cms) in valley bottoms to 45 inches/114 cms) along ridgetops. Most precipitation occurs in the winter and early summer months with 60 percent of the precipitation falling as snow. The mean annual air temperature is (30 to 50 degrees F (-1 to 10 degrees C)).

Streams typically occur on dissected mountain slopes and rivers occur in large valley bottoms. The landscape has moderately to highly dissected valleys. Wetlands occur in the alluvial valley bottoms and in cirque floors where they are associated with alluvium and glacial till. Lakes also occur in cirque floors.

The primary natural disturbance processes are frequent low intensity underburns on droughty slopes. On more moist slopes and valley bottoms, insect and disease plus higher biomass production set the stage for more severe, less frequent fires that often were stand replacing. Human-caused disturbances are very slight since most of this subsection is designated wilderness. Minor amounts of prospecting and mining have occurred.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, stream dissected uplands, and glaciated uplands.

The valley bottoms are located on low to moderate elevation sites with dominant slope gradients from 5 to 20 percent. These landscapes include floodplains, stream terraces, and some low glacial moraine landforms that are formed in mixed outwash, alluvium and till. The primary soils are deep and typically have a loamy surface layer underlain by very coarse cobbly or gravelly sands and loamy sands. The moraines often have large rock at the surface. These valley bottoms soils range from very poorly to excessively drained, depending on depth to water table. These soils are classified as Typic Cryochrepts and Typic Cryaquents. The dominant potential natural vegetation is Douglas-fir/ponderosa pine forest with areas of hydric spruce forest and willow/sedge riparian types.

The stream dissected uplands landscape are located on the valley slopes and ridges with dominant slope gradients of 35 to 80 percent. The landscapes include highly dissected steep mountain slopes and stream breaklands comprised of colluvium and residuum. The primary soils on droughty slopes are shallow and have sandy loam to loamy sand textures (Lithic Ustochrepts). On more moist slopes the soils are deep and have sandy loam to sandy clay loams over loamy sand substrata (Typic Cryochrepts, Andic Cryochrepts, and Typic Cryoboralfs). These soils often have a volcanic ash surface layer 4 to 8 inches thick. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir on droughty slopes and mesic Douglas-fir, subalpine fir, and

lodgepole pine on other slopes.

The glaciated uplands landscapes are located on the high elevation ridgetops in areas of heavy snow accumulation. Dominant slope gradients are 20 to 80 percent. These landscapes include cirque walls, cirque floors, and trough walls landforms mostly comprised of bedrock, colluvium and glacial till. The primary soils have sandy loam and loamy sand textures overlain by loamy volcanic ash caps. These soils are classified as Andic Cryochrepts. Rock outcrop and talus are dominant components of these landscapes. The dominant potential natural vegetation is subalpine fir, lodgepole pine, and whitebark pine.

Compiled By: Bitterroot NF; Ken McBride

M332An Magruder Breaklands

Location: This subsection is located in the Selway River basin of northern Idaho.

Subsection Concept: This subsection consists of mountain slopes underlain by highly weathered granitic rocks of the Idaho Batholith that have been modified by stream erosion. The major general vegetative types include dry and mesic coniferous forests and grasslands. This map unit is separated from similar subsections based upon bedrock type and degree of weathering.

Subsection Setting and General Characteristics: These stream eroded mountains have an elevation range of 4000 to 8200 feet (1220 to 2500 meters). The dominant slope range is 40 to 80 percent. The dominant types of rocks are highly weathered quartz monzonite, granite, and rhyolite. The primary geomorphic process in these landscapes is stream erosion.

Mean annual precipitation ranges from 35 inches/89 cms at the lowest elevations to 45 inches/114cms at the high ridgetops. Most precipitation occurs in the winter to early summer months with 60 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 50 degrees F (-1 to 10 degrees C).

Streams typically occur on the dissected slopes and rivers occur in the deep valleys. The landscape is mostly highly dissected. Wetlands occur alongside the streams and rivers in alluvial deposits.

The primary natural disturbance processes are frequent low intensity underburns on droughty slopes. On more moist slopes and valley bottoms, insect and disease plus higher biomass production cause more severe, less frequent fires that often are stand replacing. Human-caused disturbances are very slight since most of this subsection is designated wilderness. Minor amounts of prospecting and mining have occurred.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms and dissected uplands.

The valley bottoms are located on low to middle elevation sites with dominant slopes gradients from 5 to 20 percent. These landscapes include floodplains and stream terraces that formed in outwash and alluvium. The primary soils are deep and typically have a loamy surface layer underlain by very coarse cobbly or gravelly sands and loamy sands. These valley bottoms soils range from very poorly to excessively drained, depending on depth to water table. These soils are classified as Typic Cryochrepts and Typic Cryaquents. The dominant potential natural vegetation is Douglas-fir/ponderosa pine forest with areas of hydric spruce forest and willow/sedge riparian types.

The dissected uplands landscape are located on the valley slopes and ridges with dominant slope gradients of 35 to 80 percent. The landscapes include highly dissected steep mountain slopes and stream breaklands comprised of colluvium and residuum. The primary soils on droughty slopes are shallow and have sandy loam to loamy sand textures (Lithic Ustochrepts). On more moist slopes the soils are deep and have sandy loam to sandy clay loams over loamy sand substrata (Typic Cryochrepts, Andic Cryochrepts, and Typic Cryoboralfs). These soils often have a volcanic ash surface layer 4 to 8 inches thick. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir on droughty slopes and mesic Douglas-fir, subalpine fir, and lodgepole pine on other slopes.

Compiled By: Bitterroot NF; Ken McBride

M332Ao Salmon Canyon Breaklands

Location: This subsection is located in the Salmon River Basin of north central Idaho.

Subsection Concept: This subsection consists of highly dissected and entrenched stream breaklands with stream downcutting, in Cretaceous igneous and Precambrian metamorphic bedrock. Dry and mesic coniferous forests and grassland dominate the landscapes. This map unit is separated from similar canyon breaklands based upon bedrock lithology and climate.

Subsection Setting and General Characteristics: These canyon breaklands have an elevation range of 1800 to 7000 feet (450 to 2100 m). The slope range is 45 to more than 100 percent. The dominant lithology is weakly to moderately weathered Precambrian gneiss and schist, and Cretaceous granite and associated gneiss. The primary geomorphic processes are fluvial and mass erosion.

Mean annual precipitation ranges from 20 inches (51 cm) at low elevations to 45 inches (114 cm) at high elevations. Most precipitation occurs in the winter and spring months. Most falls as snow above about 4500 feet. The mean annual air temperature is from 38 to 54 degrees F (3 to 12 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, and wetlands. Typically the landscape is highly dissected with low order high energy streams. Large streams have their lower reaches in this subsection where they flow into the main Salmon and South Fork of the Salmon Rivers, which form the main canyons. Wetlands are few and confined to springs and seeps on slopes.

The primary natural disturbance processes are wildfire, insect and disease epidemics, herbivory, and fluvial and mass erosion. Natural fire regime at low elevations is of high frequency and low to mixed severity, and moderate to large extent. At upper elevations, fire regime is of moderate frequency, mixed severity and moderate to large extent. Surface erosion and debris torrents and debris avalanches associated with stream channels shape channels and sideslopes. Colluviation also adds material to lower slope positions and sediments are moved by the high energy streams to lower gradient reaches in larger streams or in the main River. Substrata are highly erodible. Human-caused disturbances have included grazing on primary and transitory range since the late 1800's, mining, timber harvest, and road building. Sediment production has increased as a consequence over presettlement levels.

Subsection Ecological Relationships:

This subsection includes two primary settings. These are steep stream breaklands and mountain slopes, and discontinuous depositional lands that occur in the valley floor.

The valley bottoms are of relatively minor extent but significant in their relationship to aquatic resources and history of development. Slopes are 1 to 40 percent. Valley bottoms include stream terraces, fans, and floodplains. They are formed in stratified alluvial deposits of silt, sand, gravel, cobble, and boulder. The primary soils are deep and very deep sandy loams and cobbly sands. These soils are classified as Typic Xerofluvents and Calcic Haploxerolls. The dominant potential natural vegetation is bunchgrass, ponderosa pine, and Douglas-fir series, and hardwood communities along middle reaches of streams.

Stream breaklands and steep mountain slopes dominate this subsection. Slopes are 30 to more than 100 percent. Soils form in residual and colluvial gneiss, schist, and granite and thin or mixed volcanic ash influenced loess. The primary soils are shallow to very deep loams and gravelly sandy loams. These soils are classified as Entic and Ultic Haploxerolls. The dominant potential natural vegetation is bunchgrass or ponderosa pine, Douglas-fir, or grand fir

series.

Compiled by: Nez Perce NF, Pat Green

M332Ap State Divide Uplands

Location: This subsection is located in the Salmon River Basin of Central Idaho, north of the Salmon River.

Subsection Concept: This subsection consists of old surface peneplain which contain steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands which have been formed in the granite, quartz monzonite and lower Belt Supergroup quartzite. This area has been modified by fluvial and colluvial. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from a similar subsection to the south which is very steep and contain V-shaped canyonlands and to the east which contain strongly faulted, folded uplifted ridge system.

Subsection Setting and General Characteristics: These steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands have an elevation range of 4,500 to 8,500 feet/1677 to 2591 meters. The dominate slope range is 40 to 65 percent. The dominant types of rocks are granite, quartz monzonite and lower Belt Supergroup quartzite. The primary geomorphic processes in these landscapes are fluvial and colluvial.

Mean annual precipitation ranges from 15 inches (38cm) to 45 inches (115cm). Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 34 F. to 49 degrees F. (1.1 to 9.4 degrees C).

Horse Creek, Woods Creek, Reynolds Creek, Owl Creek, Spring Creek, Squaw Creek and Indian Creek occur within the area. The landscape is slightly to highly dissected. Wetlands occur in the creek bottoms associated with alluvial deposits. Lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, recreation, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from mid to high elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams and loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Xerorthents, Haploxerolls, and Cryoborolls. The dominant potential natural forest vegetation at mid to high elevation south aspects is ponderosa pine and Bluebunch Wheatgrass; cooler aspects contain Douglas-fir, Idaho fescue, white spiraea, pinegrass and ninebark. Willows are found along riparian areas.

The moderately steep mountain slopes range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite and quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, loamy sands and loams. These soils are classified as Cryorthents, Cryochrepts, Cryumbrepts, Haploxerolls and Cryoborolls. Inclusions of Cryaquolls and Sphagnofibrists occure in the wet riparian areas. The dominant potential natural forest vegetation on the south & west aspects at low elevations is

ponderosa pine and bluebunch wheatgrass ; Douglas-fir, Idaho fescue, pinegrass, white spiraea and ninebark at mid-elevation wetter sites and subalpine fir, beargrass and menziesia at the higher elevations. Willows are found in the riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite and quartzite. The primary soils are moderately deep to deep with textures of gravelly sandy loam, loam and sands. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, white spiraea and ninebark at mid-elevation wetter sites and subalpine fir, beargrass and menziesia at the higher elevations. Willows are found throughout the riparian areas.

The cryic basinlands range from mid to high elevation sites with dominant slope gradients from 30 to 60 percent. This landscape is subdued and the ridgetops are rounded that have been modified by frost action and drainage waters of glaciers and are formed in granite and quartz monzonite. The primary soils are moderately deep with textures of gravelly or rocky sandy loams, loams, loamy sand and sand. These soils are classified as Cryorthents, Cryochrepts and Cryoborolls. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, white spiraea and ninebark at mid-elevation wetter sites and subalpine fir, beargrass and menziesia at the higher elevations. Willows are found in the riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in granite and quartz monzonite. The primary soils are shallow to moderately deep with textures of gravelly or rocky loamy sand and sandy loams. These soils are classified as Cryumbrepts, Cryorthents and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, white spiraea and ninebark at mid-elevation wetter sites and subalpine fir, beargrass and menziesia at the higher elevations. Willows are found in the riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite and quartz monzonite. The primary soils are shallow to deep with textures of gravelly or rocky sandy loams and sands. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, white spiraea and ninebark at mid-elevation wetter sites and subalpine fir, beargrass and menziesia at the higher elevations. Willows are found in the riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson /Cliff Keene

M332Aq Salmon River Breaks

Location: This subsection is located in the Salmon River Basin of Central Idaho, north of the Salmon River.

Subsection Concept: This subsection consists of steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands and strongly glaciated lands which have been formed in the granite, quartz monzonite and lower Belt Supergroup quartzite. This area has been modified by fluvial, colluvial, debris and torrents. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from a similar subsection to the south contain over steepened V-shaped canyonlands and to the north which contain broad, gently sloping ridge tops and mountain slopes.

Subsection Setting and General Characteristics: These steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands and strongly glaciated lands contain many V-shaped drainages and have an elevation range of 3,500 to 9,000 feet/1067 to 2744 meters. The dominate slope range is 40 to 65 percent. The dominant types of rocks are granite, quartz monzonite and lower Belt Supergroup quartzite. The primary geomorphic processes in these landscapes are fluvial, colluvial, debris and torrents.

Mean annual precipitation ranges from 10 inches (25cm) to 25 inches (63cm). Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 33 F. to 54 degrees F.(0.6 to 12 degrees C).

Horse Creek, Colson Creek, Owl Creek, Spring Creek, Squaw Creek and Indian Creek occur within the area. The landscape is moderately to highly dissected. Wetlands occur in the creek bottoms associated with alluvial deposits. Lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, flooding, erosion, insects and disease. Human-caused disturbances include fire, livestock grazing, old mining activities, recreation, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include steep, V-shaped canyonlands, moderately steep mountain slopes, cryic uplands and strongly glaciated lands.

The steep canyonlands range from low to high elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite. The primary soils are shallow to moderately deep with textures of gravelly or rocky sandy loams and loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Haploxerolls, Cryorthents, and Cryoborolls. The dominant potential natural vegetation in shrublands at low elevation is mountain big sagebrush, cottonwoods and Idaho fescue. The dominant potential natural forest vegetation is ponderosa pine, bluebunch wheatgrass on the south & west aspects at low elevations; Douglas-fir, Idaho fescue, ninebark, elk sedge, white spiraea and willows in riparian areas at low to mid-elevation sites.

The moderately steep mountain slopes range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite and lower Belt Supergroup quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, loamy sands and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls and Cryoborolls. Inclusions of

Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low elevation on south and west aspects is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is ponderosa pine and bluebunch wheatgrass on the south and west aspects at low elevations; Douglas-fir, Idaho fescue, ninebark, elk sedge and white spiraea at low to mid-elevation, cooler, sites; subalpine fir, beargrass and blue huckleberry on wetter sites at the higher elevations. Willows found in the riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite and quartz monzonite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams and sands. These soils are classified as Cryorthents, Cryoborolls, and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, ninebark, elk sedge and white spiraea at mid to high elevation sites; subalpine fir, beargrass and blue huckleberry at the higher elevations. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite and quartz monzonite. The primary soils are shallow to deep with textures of gravelly or rocky sandy loams and sands. These soils are classified as Cryorthents, Cryoborolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, ninebark, elk sedge and white spiraea at mid to high elevation sites and subalpine fir, beargrass and blue huckleberry at the higher elevations. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ar Big Horn Crags

Location: This subsection is located in the Middle Fork Salmon River and Panther Creek Basins of Central Idaho, south of the Salmon River, east of the Middle Fork of the Salmon River.

Subsection Concept: This subsection consists of dissected faulted uplands consisting of steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands. The bedrock consists of granite and quartz monzonite from the Crags pluton, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanic bedrock. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include grasslands, shrublands and coniferous forests. This map unit is separated from similar subsection to the north and west which contain over steepened V-shaped canyons, on the south is lower elevation mountain slopelands and the east contain faulted uplands.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 6,000 to 10,000 feet/1829 to 3049 meters. The dominate slope range is 50 to 80 percent. The dominant types of rocks are granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 30 inches (76cm) in the canyon bottoms to 60 inches (154cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 30 F. to 43 degrees F. (-1 to 6 degrees C).

Yellowjacket Creek, Wilson Creek, Roaring Creek, Big Deer Creek and Clear Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits. Numerous lakes occur in the high elevation alpine cirques found within the Frank Church- River of No Return Wilderness.

The primary natural disturbance processes are fire, windthrow, erosion, insects and disease. Human-caused disturbances include fire, recreation, forest management, few old inactive mines plus one small open pit active mine, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of five primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite, quartzite monzonite, metamorphosed pre-cambrian intrusive augen gneiss and schists. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams to loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Psamment, Cryoborolls, Haploxerolls, Cryorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at mid elevation is mountain big sagebrush, mountain snowberry, Idaho fescue and curl-leaf mountain mahogany. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, curl-leaf mountain mahogany, pinegrass, ninebark, white spiraea at

mid-elevation wetter sites. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, loamy sands, silt loams, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Cryoboralfs, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid elevation is mountain big sagebrush, mountain snowberry, Idaho fescue and curl-leaf mountain mahogany. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, curl-leaf mountain mahogany, pinegrass, ninebark and white spiraea at mid to high elevation wetter sites. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams and loams. These soils are classified as Cryorthents, Cryoborolls, and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, curl-leaf mountain mahogany, pinegrass, ninebark and white spiraea at mid to high elevation wetter sites; subalpine fir, twinflower, pinegrass, beargrass, grouse whortleberry, blue huckleberry and bluejoint at the higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in granite, quartz monzonite and lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, ninebark and white spiraea at mid to high elevation wetter sites; subalpine fir, whitebark pine, twinflower, pinegrass, beargrass, grouse whortleberry, blue huckleberry and bluejoint at the higher elevations. The highest elevations are alpine zones with rock outcrop and rubblelands. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite and quartz monzonite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, ninebark and white spiraea at mid to high elevation wetter sites; subalpine fir, whitebark pine, twinflower, pinegrass, beargrass, grouse whortleberry, blue huckleberry and bluejoint at the higher elevations. The highest elevations are of alpine zones with rock outcrop and rubblelands. Willows are found throughout the area along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332As Stanley Uplands

Location: This subsection is located in the Middle Fork of the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of strongly uplifted rejuvenated, highly dissected granitic glaciated mountain ridge system consisting of steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands. The bedrock consists of granite, quartz monzonite and minor amounts of volcanic and sedimentary bedrock. This area is part of the Trans Challis Fault System. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which contain steep, rugged glaciated mountains, strongly rejuvenated lands and headlands of the South Fork of the Salmon River, streamcut mountain and canyonlands to the east, glaciated mountains and rolling uplands descending into broad, deeply filled valley bottomlands on the west and glacial filled basin and lake basin with moraines on the south.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 9,500 feet/1524 to 2896 meters. The dominate slope range is 45 to 70 percent. The dominant types of rocks are granite, quartz monzonite and minor amounts of volcanics and sedimentary bedrock. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 15 inches (38cm) in the canyon bottoms to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 31 F. to 48 degrees F. (-0.6 to 9 degrees C).

Salmon River, Middle Fork of the Salmon River, Loon Creek, Mayfield Creek, Rapid River, marsh Creek, Bear Valley Creek, Boundary Creek and Soldier Creek occur within the area. The landscape ranges from slight to highly dissected with glacial-fluvial and alluvial deposits. Numerous high elevation lakes occur in cirque basins within the Frank Church-River of No Return Wilderness.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, erosion, recreation, forest management, active small mining operations including old mining activities and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite and quartzite monzonite. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are shallow to moderately deep with textures of gravelly or rocky loam. These soils are classified as Cryorthents, Cryochrepts and Cryaquolls in riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Idaho fescue and willows.

The mountain slopelands range from low to mid elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that

are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite and minor inclusions of argillite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam and loam. These soils are classified as Cryorthents and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid-elevation on south and west aspects is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, pinegrass, ninebark and bluebunch wheatgrass at mid elevation wetter sites. Willow occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite and quartz monzonite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam. These soils are classified as Cryorthents and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, elk sedge, mountain snowberry, white spiraea, pinegrass and ninebark at mid-elevation wetter sites and subalpine fir, whitebark pine, grouse whortleberry, pinegrass, elk sedge, white spiraea at the higher elevations. Inclusions of ponderosa pine and bitterbrush along the Middle Fork of the Salmon River at low to mid elevations. The highest elevations are alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The cryic basinlands range from mid to high elevation sites with dominant slope gradients from 30 to 60 percent. This landscape is subdued and the ridgetops are rounded that have been modified by frost action and drainage waters of glaciers and are formed in granite and quartz monzonite. The primary soils are shallow to moderately deep to deep with gravelly or rocky loam textures. These soils are classified as Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, elk sedge, mountain snowberry, white spiraea, pinegrass and ninebark at mid-elevation wetter sites and subalpine fir, grouse whortleberry, pinegrass, elk sedge, white spiraea at the higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in granite and quartz monzonite. The primary soils are shallow to moderately deep with textures of gravelly or rocky sandy loam. These soils are classified as Cryorthents, Cryochrepts and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, elk sedge, mountain snowberry, white spiraea, pinegrass and ninebark at mid-elevation wetter sites and subalpine fir, whitebark pine, grouse whortleberry, pinegrass, elk sedge, white spiraea at the higher elevations. Highest elevations are alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite and quartz monzonite. The primary soils are shallow to deep with textures of gravelly or rocky loam and and sandy loam. These soils are classified as Cryorthents, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, elk sedge, mountain snowberry, white spiraea, pinegrass and ninebark at mid-elevation wetter sites and subalpine fir, whitebark pine, grouse whortleberry, pinegrass, elk sedge, white spiraea at the higher elevations. Highest elevations are alpine zone with rock outcrop and rubbleland. Willows are

found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Cliff Keene

M332At Sawtooth Range - Boise Mountains

Location: This subsection is located in the Salmon River, North Fork Boise River, Middle Fork Boise River and South Fork Payette River Basins of Central Idaho.

Subsection Concept: This subsection consists of faulted block mountain range containing mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. Also included are valleys filled with basin materials, fan terraces, glacial moraine depositional lands and alluvial deposited flood plains. The bedrock consists of granite and minor amounts of sedimentary, metamorphic and volcanics. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north, south and west which is lower elevation mountain ranges and eastward which is a fault block valley.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 7,000 to 10,751 feet/2134 to 3278 meters. The dominant slope range is 0 to 90 percent. The dominant types of rocks are granite, sedimentary, metamorphics and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 30 inches (77cm) at low elevation to 50 inches (128 cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 27 F. to 40 degrees F. (-3 to 4 degrees C).

North Fork Boise River, Middle Fork Boise River, South Fork Payette River, Queens River, Fishhook Creek, Redfish Lake Creek, Huckleberry Creek, Alpine Creek, Beaver Creek, Smiley Creek, Mattingly Creek, Goat Creek and Baron Creek occur within the area. The landscape ranges from slight to highly dissected. Riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, livestock grazing, mining activities, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain soils and fan terraces.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 90 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite and minor amounts of metamorphic bedrock. The primary soils range from very shallow to deep with textures of stony, cobbly or rocky sandy loam, loam, loamy sand and sand. These soils are classified as Cryorthents, Cryochrepts, Cryopsamments and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest

elevations contain an alpine zone with occasional whitebark pine and subalpine fir occurring within rock outcrop and rubbleland. Willows and aspen occur along riparian areas.

The fan terrace and alluvial lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 55 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite. The primary soils are moderately deep to deep with textures of gravelly or cobbly loam, sandy loam, sand and loamy sand. These soils are classified as Haploborolls, Cryoborolls, Cryorthents, Cryochrepts, Cryopsamments and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows and cottonwoods.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Falma Moye,
Sawtooth National Forest; Deb Bumpus

M332Au Smokey Mountain Trough Lands

Location: This subsection is located in the South Fork Boise River and Big Smoky Rivers of South Central Idaho.

Subsection Concept: This subsection consists of glaciated headlands of granodiorite that have been modified by glaciation. The major general vegetative types include Douglas Fir and Subalpine Fir. This map unit is separated from similar subsections based upon its extensive glacial activities.

Subsection Setting and General Characteristics: These glacial headlands have an elevation range of 6400 to 10000 feet/1950 to 3048 meters. The dominant slope range is 45 to 65 percent. The dominant types of rocks are Granodiorite with some sedimentary rocks, and volcanics. The primary geomorphic processes in these landscapes are glacial.

Mean annual precipitation ranges from 40 inches/102 cms to 50 inches/127 cms. Most precipitation occurs in the winter with over 80 percent of the precipitation falling as snow. The mean annual air temperature is 27 degrees F/-2 degrees C.

Rivers typically occur in the glacial troughs and the streams are typically found in the valley train lands. The landscape is slightly to moderately dissected on the slopes.

The primary natural disturbance process is frost churning. Human-caused disturbances are minimal but include mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include glacial troughs, alpine glaciated ridge systems and cirque headlands, and valley train lands.

The glacial troughs are located on mid elevation sites with dominant slope gradients from 45 to 75 percent. These landscapes include the major drainages in the area. Granodiorite is dominate in weathering classes 3 and 4. Challis volcanics and Wood River sedimentary rocks are common in the Big Smoky drainage. The primary soils are shallow coarse and loamy textured. These soils are classified as Lithic Cryorthents. The dominant potential natural vegetation is alpine and Douglas fir, and shrub communities.

The alpine glaciated ridge and cirque headlands are located on high elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include classic glaciated landforms that are formed in granodiorite. The primary soils are moderately deep and coarse textured. These soils are classified as Typic Cryorthents and Cryumbrepts. The dominant potential natural vegetation is subalpine big sagebrush.

The valley train lands are located on low elevation sites with dominant slope gradients from 15 to 45 percent. These landscapes include the streams themselves and the flood prone bottoms. The primary soils are moderately deep and deep coarse textured soils. These soils are classified as Typic Cryumbrepts and Cryorthents. The dominant potential natural vegetation is subalpine and Douglas fir.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Av Upper South Fork Boise River Stream Cut Lands

Location: This subsection is located in the South Fork Boise River of South Central Idaho.

Subsection Concept: This subsection consists of a rejuvenated basin of granitic bedrock that has been modified by differential uplifting. The major general vegetative types include Douglas Fir with elksedge, pinegrass, bluebunch wheat grass, and snowberry. This map unit is separated from similar subsections based upon its strongly entrenched unglaciated characteristics.

Subsection Setting and General Characteristics: This basin has an elevation range of 5000 to 9000 feet/1524 to 2743 meters. The dominant slope range is 30 to 65 percent. The dominant types of rocks are granite, except in the eastern portion which is formed in volcanics and sedimentary rocks. The primary geomorphic processes in these landscapes are differential uplifting. This section also contains some areas which are weakly glaciated, slopes which have been geologically oversteepened, and some depositional lands near the river.

Mean annual precipitation ranges from 30 inches/76 cms in the lower elevation areas to 50 inches/127 cms in the high elevation mountains. Most precipitation occurs in the winter with 70 percent of the precipitation falling as snow. The mean annual air temperature is 43 to 49 degrees F/6-9.4 degrees C.

The heads of Deadwood and Boardman Creeks have been weakly glaciated. Slopes near the main drainage have been geologically oversteepened. The deeply entrenched character of the valley and ridge system indicate an acceleration of erosional processes due to uplifting. The landscape is moderately to highly dissected.

The primary natural disturbance processes are fire, insects, disease, and accelerated erosion. Human-caused disturbances include grazing, logging, and recreation.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include moderately and well dissected fluvial mountain slopes, glaciated headlands, oversteepened canyons, and depositional lands.

The dissected fluvial mountain slopes are located on mid elevation sites with dominant slope gradients from 35 to 65 percent. These landscapes include mountain slopes that are formed in granitic material(s) to the west and volcanics and sedimentary rocks to the east. The primary soils are moderately deep sandy loam to loamy sands on the western slopes, and sandy loams to loams on the eastern slopes. These soils are classified as Typic Ultic argixerolls, and Typic Xerumbrepts, cryumbrepts and Cryorthents. The dominant potential natural vegetation is Douglas Fir habitat types.

The glaciated headlands are located on high elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include weakly glaciated granitics. The primary soils are moderately deep with sandy loam textures. These soils are classified as Typic Cryorthents and Cryumbrepts. The dominant potential natural vegetation is subalpine fir habitat types.

The oversteepened canyons are located on low to mid elevation sites with dominant slope gradients from 50 to 75 percent. These landscapes include canyon sides along the major drainage that are formed in predominately granitic parent material(s). The primary soils are shallow and sandy loam textured. These soils are classified as Lithic Xerumbrepts and Xeropsamments. The dominant potential natural vegetation is shrub lands.

The depositional lands are located on low elevation sites with dominant slope gradients from 10 to 25 percent. These landscapes include narrow bands adjacent to the river and its major tributaries. The primary soils are deep with sandy loam textures. These soils are classified as Typic Xerumbrepts and Cryorthents. The dominant potential natural vegetation is Douglas Fir habitat types.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Aw Soldier Mountain Foothills

Location: This subsection is located in the Boise River basin of central Idaho.

Subsection Concept: This subsection consists of the south facing front of the Idaho Batholith of granite that have been modified by frost churning and fluvial processes. The major general vegetative types include Douglas fir and shrublands. This map unit is separated from similar subsections based upon the fact that this is the first major uplifted ridge system of the Northern Rocky Mountain Province. It is separated on the south by the volcanic rock, and on the north by the stream cut and sharp ridges there.

Subsection Setting and General Characteristics: These southern Batholith, and fluvial lands have an elevation range of 3500 to 8000 feet/1065 to 2440 meters. The dominant slope range is 20 to 60 percent. The dominant types of rocks are granite, weathering class 4 and 5, with numerous dikes of darker igneous intrusions. The primary geomorphic process in these landscapes are fluvial granitics, cryic uplands actively eroding and fluvial wet and dry creep.

Mean annual precipitation ranges from 20 inches/51 cms to 40 inches/98 cms. Most precipitation occurs in the winter with 60 percent of the precipitation falling as snow. The mean annual air temperature is 43 degrees F/6 degrees C.

The unit is drained to the south by Big Deer Creek, Little Creek, Coral Creek, Three Mile Creek and Soldier Creek. The upper lands are well dissected. The remaining lands are moderately dissected.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include recreation, grazing, logging and arson.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include 55% fluvial mountain slopes and 25% xeric fluvial slopes. Only 10 percent are cryoplanated lands.

The mountain slopes are located on high elevation sites with dominant slope gradients from 50 to 60 percent. These landscapes include frost churned slopes that formed in granitic parent material(s). The primary soils are shallow to moderately deep with loamy skeletal textures. These soils are classified as Lithic and Typic Cryumbrepts, Cryoborolls, and Cryumbrepts. The dominant potential natural vegetation is widely variable with many brush fields formerly occupied by conifer habitat types. Small amounts of Douglas fir are found on northern aspects.

The xeric fluvial slopes are located on low elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include mountain slopes that are formed in granitic parent material(s). The primary soils are shallow and moderately deep loamy skeletal textured. These soils are classified as Lithic and Typic Xerorthents, Argic Argixerolls, and Ultic Haploxeralfs. The dominant potential natural vegetation is brush fields with small conifer patches.

Timber production is important in the northern portion of the subsection. The entire subsection is an important wildlife area during summer season.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Ax Moores Flat

Location: This subsection is located in the Boise River Basin of central Idaho.

Subsection Concept: This subsection consists of volcanic flow lands of Snake River Basalt flows and older, more silicic flows of the Pliocene Epoch underlain by granitics of the Atlanta grandodiorite. The major general vegetative types include brush/grass community with mountain big sage/blue bunch wheatgrass, bitterbrush/blue bunch wheatgrass. It has a pristine stand of great basin wild rye. This map unit is separated from similar subsections based upon climatic characteristics and parent material. This is the interface with volcanics and granitics. Less than 20 percent of the area is timbered and xeric soils dominate the southern slopes.

Subsection Setting and General Characteristics: These volcanic flows have an elevation range of 3500 to 5000 feet/1060 to 1525 meters. The dominant slope range is 5 to 30 percent. The dominant types of rocks are silic volcanic, basalt, underlain by granitics. The primary geomorphic process in these landscapes are fluvial with remnants of volcanic flows.

Mean annual precipitation ranges from 15 inches/37 cms to 25 inches/61 cms. Most precipitation occurs in the winter and spring with only 50 percent of the precipitation falling as snow. The mean annual air temperature is 45 degrees F/7.2 degrees C.

The primary natural disturbance processes are fire. Human-caused disturbances include suburban and recreational development and grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 40% xeric fluvial slopes, 30% silic volcanic lands, and 20% depositional lands.

The xeric slopes are located on high elevation sites with dominant slope gradients from 25 to 45 percent. These landscapes include dry mountain side slopes that have formed in granitic parent material. The primary soils are shallow to deep with sandy loam or coarser textures. These soils are classified as Lithic and Typic Haploxeralfs, Cryumbrepts, and Xeric psamments. The dominant potential natural vegetation is subalpine big sagebrush.

The silic volcanic lands are located on mid elevation sites with dominant slope gradients from 25 to 55 percent. These landscapes include steep highly dissected exposed and uplifted lands overlaying the granodiorite. The primary soils are moderately deep skeletal sandy clay loams. These soils are classified as Typic Cryumbrepts and Xerumbrepts. The dominant potential natural vegetation is subalpine big sagebrush with Douglas fir in some northern aspects.

The depositional lands are located on low elevation sites with dominant slope gradients from 10 to 30 percent. These landscapes include river flood plains with some basalt rockland. The primary soils are moderately deep to deep with clay loam textures. These soils are classified as Typic Haploxeralfs, Cryumbrepts, and Xeric Psamments.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Ay Cayuse Point

Location: This subsection is located in the Boise River Basin of south central Idaho.

Subsection Concept: This subsection consists of a dissected basin surrounded by cryic ridges of granitic bedrock weathering class 3 to 6. The major general vegetative types include Ponderosa Pine, Douglas Fir and subalpine fir. There are a few white bark pine vegetative types on the highest elevations of the subsection. This map unit is separated from similar subsections based upon the broad rolling uplands that appear to be remnants of a former basin floor.

Subsection Setting and General Characteristics: This basin has an elevation range of 4000 to 9000 feet/1220 to 2600 meters. The dominant slope range is 30 to 60 percent. The dominant types of rocks are Granite and commonly, intrusive dikes. The primary geomorphic processes in these landscapes are fluvial granitics, dendritic drainage, frost churning, and wet and dry creep.

Mean annual precipitation ranges from 25 inches/61 cms on the driest south slopes at low elevations to 50 inches/127 cms in the high elevations. Most precipitation occurs in the winter with 70 percent of the precipitation falling as snow. The mean annual air temperature is 48 degrees F/8.9 degrees C.

There are wide river deposits adjacent to the Boise River as it passes through the subsection. The steepest slopes are adjacent to the main drainage in the form of oversteepened canyon lands. It is drained mainly by a dendritic pattern of streams.

The primary natural disturbance processes are fire, insects, disease, and frost churning. Human-caused disturbances include grazing, timber harvest, dredging, and old mining towns in Featherville, Atlanta and Rocky Bar.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include 40% Fluvial lands of dissected basin, 20% cryic uplands, and 15% granitic headlands.

The fluvial lands are located on mid elevation sites with dominant slope gradients from 15 to 45 percent. These landscapes include broad rolling upland ridges interspersed by steep sloped drainageways. Bedrock is almost entirely granitic. Intrusive dikes are common. The primary soils are moderately deep and deep, moderately coarse to coarse textured granitic soils. These soils are classified as Typic Xerumbrepts, Xeropsamments and Cryorthents. Also some Typic Ultic Argixerolls. The dominant potential natural vegetation is Douglas-fir habitat types.

The cryic uplands are located on high elevation sites with dominant slope gradients from 40 to 60 percent. These landscapes include steep sharp ridges. Bedrock is granitic. The primary soils are moderately deep and shallow, moderately coarse to coarse textured granitic soils. These soils are classified as Typic and Lithic Xerumbrepts, and Cryorthents.

The granitic headlands are located on high elevation sites with dominant slope gradients from 35 to 55 percent. These landscapes encircle the subsection and are formed in granitic parent material(s). The primary soils are shallow or moderately deep with textures ranging from sandy loam to loam sands. These soils are classified as Lithic and Typic Cryorthents, and Cryumbrepts. The dominant potential natural vegetation is Douglas fir and subalpine fir habitats.

Geothermal activity is responsible for some of the concentrated mining that

historically took place in this area. Mines for gold and silver are still active.

Compiled By: Boise National Forest, Leah Juarros

M332Az House Mountain

Location: This subsection is located in the Boise River Basin of Southwest Idaho.

Subsection Concept: This subsection consists of the cryoplanated headlands and older troughs of quartz monzonite that have been modified by older glacial deposits and younger, fluvial granitics. The major general vegetative types include Douglas Fir habitat types. This map unit is separated from subsections to the north by it's lack of glaciation and it's older landforms, to the west by the basalt foothills, and to the South by the basalt canyon lands.

Subsection Setting and General Characteristics: These Granitic troughs and headlands have an elevation range of 3500 to 8000 feet/1065 to 2440 meters. The dominant slope range is 35 to 65 percent. The dominant types of rocks are quartz monzonite, granodiorite, quartz diorite, aplite, pegmatite dikes, dacite/granophyre dikes. The primary geomorphic processes in these landscapes are glacial deposits, and frost churning.

Mean annual precipitation ranges from 30 inches/72 cms to 45 inches/110 cms. The higher precipitation occurs above 5000 feet elevation. Most precipitation occurs in the winter with 80 percent of the precipitation falling as snow. The mean annual air temperature is 22 to 64 degrees F/-6 to 18 degrees C.

Streams typically occur in the old trough bottoms. Streams on the south and west boundary are in streamcut lands with thin remnants of basalt escarpments. The landscape is moderately to strongly dissected.

The primary natural disturbance processes are fire, insects, disease, and frost churning. Human-caused disturbances include past mining activities.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include cryoplanted headlands and fluvial slopes. Bottom lands and escarpments adjacent to the South Fork of the Boise River make up less than 10 percent of the subsection.

The cryoplanted headlands are located on high elevation sites with dominant slope gradients from 35 to 65 percent. These landscapes include dissected mountain slopes of granitic parent material(s). The primary soils are moderately deep to shallow sandy skeletal. These soils are classified as Typic and Lithic Cryorthents. The dominant potential natural vegetation is brush and subalpine habitat types.

The fluvial slopes are located on the mid elevation sites with dominant slope gradients from 35 to 65 percent. These landscapes include moderately dissected mountain slopes of granitic parent material. The primary soils are moderately deep sandy skeletal. These soils are classified as Typic Cryorthents. The dominant potential natural vegetation is conifer forests.

Anderson Ranch Reservoir is located in the southern portion of this subsection.

Compiled By: Boise National Forest, Leah Juarros

M332Aaa Basin Butte - Horton Peak

Location: This subsection is located in the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountains containing mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite with minor amounts of sedimentary and volcanics. This area has been modified by fluvial, colluvial, frost churning and mass wasting. The major general vegetation types include shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north and east which is high elevation mountain ranges, to the west and south is a fault block valley.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands have an elevation range of 6,500 to 9,954 feet/1982 to 3035 meters. The dominant slope range is 5 to 70 percent. The dominant types of rocks are granite, sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 20 inches (51cm) at low elevation to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 30 F. to 41 degrees F. (-1 to 5 degrees C).

Salmon River, Beaver Creek, Valley Creek, Basin Creek, Yankee Fork, Champion Creek, Fourth of July Creek, Fisher Creek, Williams Creek, Rough Creek, Big and Little Casino Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, mining activities, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include steep canyonlands, mountain soils, foothills and fan terraces.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 55 to 80 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite bedrock. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are shallow to moderately deep with textures of gravelly or rocky sandy loam, loam, loamy sand and clay loam. These soils are classified as Haploxerolls, Cryorthents, Cryochrepts and Cryoborolls. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Idaho fescue, curl-leaf mountain mahogany, aspen and willows.

The mountain soils range from low to high elevation sites with dominant slope gradients from 20 to 60 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite and minor amounts of sedimentary and

volcanics bedrock. Some areas include steep V-shaped drainages while others contain slumps. The primary soils range from shallow to deep with textures of stony, cobbly or rocky sandy loam, loam, loamy sand and clay loam. These soils are classified as Cryorthents, Xerorthents, Cryochrepts, Cryoborolls, Argixerolls, Xerochrepts, Haploxeralfs and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest elevations contain an alpine zone with rock outcrop and rubbleland and occasional subalpine fir. Willows and aspen occur along riparian areas.

The foothill lands are found at low to mid elevation sites with dominant side slope gradients from 5 to 45 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in granite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loam, clay loam, silt loam and loamy sand. These soils are classified as Cryoborolls, Argixerolls, Cryochrepts, Cryorthents, Cryaquolls and Haploxerolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows, cottonwoods and inclusions of curl-leaf mountain mahogany on the rocky hillsides.

The fan terrace lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 55 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite, sedimentary and volcanics. The primary soils are moderately deep to deep with textures of gravelly or cobbly loam, sandy loam and loamy sand. These soils are classified as Cryoborolls, Cryorthents, Cryochrepts, Cryopsamments and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue and willows.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Falma Moye

M332Abb Stanley Basin - Sawtooth Valley

Location: This subsection is located in the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of fault block valley containing mountain slopelands, cryic uplands and fan terraces. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite. This area has been modified by fluvial and colluvial. The major general vegetation types include grasslands, shrublands and coniferous forests. This map unit is separated from similar subsection to the north, east, south and west which is high elevation faulted, folded mountain ranges.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands and foothill lands have an elevation range of 6,000 to 7,500 feet/1829 to 2287 meters. The dominant slope range is 0 to 65 percent. The dominant types of rocks are granite. The primary geomorphic processes in these landscapes are outwash deposition and glacial moraines.

Mean annual precipitation ranges from 20 inches (51cm) at low elevation to 30 inches (77cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 40 F. to 43 degrees F. (4 to 6 degrees C).

Salmon River, Stanley Lake Creek, Stanley Creek, Marsh Creek, Beaver Creek, Valley Creek, Fourth of July Creek, Fisher Creek, Williams Creek, Fishhook Creek, Alturas Lake Creek, Redfish Lake Creek, Hell Roaring Creek, Huckleberry Creek and Pole Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the area.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, livestock grazing, erosion and paved and dirt roads.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain soils and fan terraces.

The mountain soils range from low to high elevation sites with dominant slope gradients from 20 to 65 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations) and were formed in granite bedrock. The primary soils range from shallow to deep with textures of stony, cobbly or rocky sandy loam, loam, loamy sand and clay loam. These soils are classified as Cryorthents, Cryochrepts, Cryoborolls and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, elk sedge, bluebunch wheatgrass, grouse whortleberry and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. Willows and aspen occur along riparian areas.

The fan terrace and alluvial bottom lands are found at mid elevation sites with dominant side slope gradients from 0 to 60 percent. This landscape has benches, glacial moraine depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite and volcanics. The primary soils are moderately deep to deep with textures of cobbly or gravelly loam, sandy loam and loamy sand. These soils

are classified as Typic Cryoborolls, Argic Cryoborolls, Cryorthents, Cryochrepts, Cryopsamments and in wet riparian areas are found Aquic Cryoborolls, Typic Cryaquolls and Terric Borosaprists. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue and willows.

Compiled By: Salmon-Challis National Forests; Gary Jackson, Sawtooth National Forest; Deb Bumpus

M332Acc Sawtooth Foothills

Location: This subsection is located in the South Fork Payette River, the North and Middle Forks of the Boise River of south central Idaho.

Subsection Concept: This subsection consists of steep rejuvenated slopes of quartz monzonite and granodiorite. It is an example of west sloping tilted block faulting. About 25 percent of the area is glaciated. The major vegetative types include Douglas Fir, Alpine Fir, with understories of spirea, elk sedge, and pinegrass.

Subsection Setting and General Characteristics: These rejuvenated slopes, glaciated and valley train lands have an elevation range of 5000 to 7500 feet/1524 to 2286 meters. The dominant slope range is 45 to 65 percent. The dominant types of rocks are quartz monzonite in the north and granodiorite in the south. The primary geomorphic process in these landscapes are the result of high-angle, westward tilting, block faulting activities.

Mean annual precipitation ranges from 30 inches/76 cms to 45 inches/114 cms. Most precipitation occurs in the winter season with 80 percent of the precipitation falling as snow. The mean annual air temperature is 27 to degrees F/-2.8 degrees C.

The three main drainages typically occur in steep granitic canyon lands. The landscape is well dissected.

The primary natural disturbance processes are fire, debris slides and avalanches on the steep slopes. Human-caused disturbances include historical mining sites.

Subsection Ecological Relationships:

This subsection consists of 40% strongly dissected mountain slopes, 35% weak to moderately dissected glacial troughs and headlands, 10% steep granitic canyon lands and depositional and fluvial lands.

The strongly dissected mountain slopes are located on mid elevation sites with dominant slope gradients from 45 to 60 percent. These landscapes include mountain slopes that are formed in granitic parent material. The primary soils are moderately deep to deep coarse loamy skeletal soil. These soils are classified as Typic and Lithic Cryumbrepts. The dominant potential natural vegetation is Douglas Fir types.

The weak to moderate dissected glacial troughs and headlands are located on high elevation sites with dominant slope gradients from 50 to 75 percent. These landscapes include glacial troughs and headlands that are formed in granitic parent material. The primary soils are shallow to moderately deep sandy to coarse loamy skeletal. These soils are classified as Typic and Lithic Cryorthents. The dominant potential natural vegetation is Alpine Fir. Many of the steep south facing slopes have been classified as non commercial timberland.

The steep granitic canyon lands are located on low elevation sites with dominant slope gradients from 50 to 75 percent. These landscapes include steep sides of canyons that are formed in granitic parent material. The primary soils are shallow to deep sandy to coarse loamy skeletal. These soils are classified as Typic and Lithic Cryorthents. The dominant potential natural vegetation is Douglas Fir types.

The Graham Historical Mining Site is located in this subsection. The majority is unroaded but does include the Upper North Fork of Boise scenic drive.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Add South Fork Payette Canyon

Location: This subsection is located in the South Fork Payette River of central Idaho.

Subsection Concept: This subsection consists of rejuvenated cryic slopes of quartz monzonite that have been modified by fluvial, wet and dry creep. The major general vegetative types include Douglas Fir with ninebark, white spirea, and snowberry. This map unit is separated from similar subsections based upon entrenchment by the Payette River and portions of its main tributaries. Considerable abnormally weathered bedrock (possible hydrothermal activity) is present. Naturally barren slopes are present.

Subsection Setting and General Characteristics: These slopes have an elevation range of 4000 to 8500 feet/1219 to 2591 meters. The dominant slope range is 45 to 75 percent. The dominant types of rocks are quartz monzonite of weathering class 4-5, swarm dikes of andesite and rhyolite. Canyons have a more competent weathering class (2-3) quartz monzonite. The primary geomorphic processes in these landscapes are rejuvenated frost churned slopes in the upper elevations and headland positions as well as frost churned uplands on the ridges. Dissected granitic fluvial lands and canyon lands occur in the mid and lower positions. About 25 percent of these lands are in a drier moisture regime.

Mean annual precipitation ranges from 30 inches/76 cms in the lower location near Garden Valley, to 45 inches/114 cms in the higher locations. Most precipitation occurs in the winter season with 70 percent of the precipitation falling as snow. Northern slopes are almost always snow covered from December through April. South facing slopes below 5500 feet seldom have persistent snow. The mean annual air temperature is 55 to 62 degrees F/13-17 degrees C.

The main drainage, the South Fork Payette River, typically occurs in steep canyon lands. The other principle drainages, the Deadwood River and Clear Creek, are located in the dissected granitic fluvial lands.

The primary natural disturbance processes are hydrothermally altered bedrock which causes mass failures, and fire. Human-caused disturbances include summer homes, developed hot springs, and road problems along Hiway 21.

Subsection Ecological Relationships:

This subsection consists of 55% strongly and moderately dissected granitic fluvial lands (10% are xeric), 15% canyon lands, and 15% rejuvenated frost churned slopes and canyon lands.

The strongly and moderately dissected granitic fluvial lands and canyon lands are located on low and mid elevation sites with dominant slope gradients from 45 to 75 percent. These landscapes include 25 percent xeric lands in well weathered granitics. The primary soils are moderately deep sandy skeletal and loamy skeletal. These soils are classified as Typic Cryumbrepts and Xerumbrepts, and Cryorthents and Xerorthents. The dominant potential natural vegetation is Douglas fir habitats.

The rejuvenated frost churned slopes are located on high elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include broad ridges and steep slopes that are formed in granitic parent material(s). The primary soils are moderately deep sandy skeletal and loamy skeletal. These soils are classified as Typic Cryumbrepts and Cryorthents. The dominant potential natural vegetation is Douglas Fir habitats.

The town of Lowman and many summer homes are in this area. Highway 21 runs east-west through the subsection. There is hydrothermally altered bedrock and associated hot springs.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Aee Lowman Uplands.

Location: This subsection is located in the Crooked River of south central Idaho.

Subsection Concept: The dominant bedrock is coarse quartz monzonite, a change in rock type from the granodiorite to the south. The contact between these two rock types may exert some structural control in the area. The controlling features of the area are the broad, rolling, upland appearance, and the well-developed dendritic stream pattern in the area. Pegmatite and aplite dikes are common. This area appears to represent structural remnants of a land surface which was bisected by the South Fork of the Payette River.

Subsection Setting and General Characteristics: These Uplands have an elevation range of 5000 to 7500 feet/1524 to 2286 meters. The dominant slope range is 15 to 45 percent. The dominant types of rocks are quartz monzonite with dikes of pegmatite and aplite. The primary geomorphic processes in these landscapes are fluvial, wet and dry creep.

Mean annual precipitation ranges from 35 inches/89 cms on the lower south facing slopes to 45 inches/114 cms on the upper north facing slopes. Most precipitation occurs in the winter with 70 percent of the precipitation falling as snow. The mean annual air temperature is 26 degrees F/-3.3 degrees C.

The primary natural disturbance processes are fire and insects. Human-caused disturbances include Mining sites such as Old Banner Mine and Crooked River Dredge Area.

Subsection Ecological Relationships:

This subsection consists of three primary landscape setting. These are 55% Mature Relief Fluvial lands with moderate amounts (20%) of rejuvenated frost churned mountain slope lands and a small amount (less than 10%) of glaciated lands.

The Mature Relief Fluvial lands are located on mid elevation sites with dominant slope gradients from 25 to 45 percent. These lands are formed in quartz monzonite. The primary soils are moderately deep to deep coarse loamy soils. These soils are classified as Typic Xerorthents and Xerumbrepts. The dominant potential natural vegetation is Douglas fir.

The Rejuvenated frost churned slopes are located on high elevation sites with dominant slope gradients from 15 to 30 percent. These landscapes are formed in quartz monzonite. The primary soils are moderately deep and deep coarse loamy soils. These soils are classified as Typic Cryorthents and Cryumbrepts. The dominant potential natural vegetation is Douglas Fir.

The Glaciated lands are located on high elevation sites with dominant slope gradients from 30 to 45 percent. These landscapes include Wolf Mountain and the surrounding area. These lands are formed in quartz monzonite. The primary soils are moderately deep coarse loamy textured. These soils are classified as Typic Cryorthents and Cryumbrepts. The dominant potential natural vegetation is subalpine fir.

Banner mine and Crooked River dredge area are evidence of mining activities.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Aff Boise Basin Lands

Location: This subsection is located in Grimes and Mores Creek of west central Idaho.

Subsection Concept: This subsection consists of batholith basin lands and includes mature relief lands of quartz monzonite that have been modified by mature fluvial granitics. The major general vegetative types include Douglas Fir, spirea and ninebark. This map unit is separated from similar subsections based upon anomalies such as ancient lakes, sediment remnants and highly weathered non-granitic bedrock which contributes to finer textured soil materials than are found in adjacent subsections.

Subsection Setting and General Characteristics: These basin lands have an elevation range of 3900 to 7000 feet/1189 to 2134 meters. The dominant slope range is 10 to 50 percent. The dominant types of rocks are quartz monzonite and a variety of associated granitic rocks. Also identified are numerous dikes and dike swarms containing a quartz hornblende biotite monzonite porphyry and some pegmatites, aplites, and lamprophyres. The primary geomorphic process(es) in these landscapes are mature fluvial granitics, and wet and dry creep.

Mean annual precipitation ranges from 20 inches/51 cms to 30 inches/76 cms. Most precipitation occurs in the winter with 70 percent of the precipitation falling as snow. The mean annual air temperature is 23 to 66 degrees F/-5 to 19 degrees C.

These lands typically have a finely meshed dendritic stream pattern.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include numerous Boise Basin mining towns.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 40% Mature relief lands, 30% Moderately to Strongly dissected granitic fluvial land, and 10 % Fluvial lands adjacent to the major streams.

The Mature relief lands are located on mid elevation sites with dominant slope gradients from 10 to 30 percent. These landscapes give an overall rounded appearance characteristic of granitic in weathering class 5 and 6. These lands have a moderate to moderately high soil erosion potential in response to management practices but delivery efficiencies to streams are moderately low to low. The primary soils are moderately deep to deep, sandy to coarse loamy in texture. These soils are classified as Typic Cryorthents, Cryumbrepts and Cryoboralfs. The dominant potential natural vegetation is Douglas fir and Ponderosa Pine.

The Moderately to Strongly dissected Granitic Fluvial lands are located on mid elevation sites with dominant slope gradients from 30 to 50 percent. These landscapes include the basin walls and are formed in granitic material(s). The primary soils are shallow to moderately deep, and have sandy or coarse loamy textures with some subsoils being skeletal. These soils are classified as Typic Cryorthents and Lithic Cryorthents and Cryoboralfs. The dominant potential natural vegetation is Douglas Fir habitats.

The Fluvial lands are located on low elevation sites with dominant slope gradients from 10 to 20 percent and are adjacent to major streams. These landscapes include deposits derived from the granitic parent material(s) that make up the basin. The primary soils are deep layers of sandy and skeletal deposits. These soils are classified as Typic Cryorthents. The dominant potential natural vegetation is Ponderosa Pine and Douglas Fir.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Agg Boise Ridge - Payette Canyon Lands

Location: This subsection is located in the Payette River Basin of central Idaho.

Subsection Concept: This subsection consists of canyon lands with a ridge of basalt flows, quartz diorite and granitics that have been modified by fluvial, wet and dry creep, and frost churning. The major general vegetative types include Douglas Fir, spirea, nine bark, snowberry, and chokecherry. This map unit is separated from similar subsections based upon its complexity as a transitional from the Northern Rocky to the Intermontane Provinces.

Subsection Setting and General Characteristics: These canyon lands have an elevation range of 4000 to 6800 feet/1219 to 2073 meters. The dominant slope range is 30 to 75 percent. The dominant types of rocks are basalt, quartz diorite, and granitics, also in the west are young relatively incompetent sediment groups of rock. The primary geomorphic processes in these landscapes are fluvial, wet and dry creep, and frost churning.

Mean annual precipitation ranges from 18 inches/48 cms at Lucky Peak Dam to 35 inches/89 cms at Peer Point. Most precipitation occurs in the winter and spring with 60 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 76 degrees F/76-193 degrees C.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include Bogus Basin recreation area, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 30% Strongly Dissected Granitic Fluvial, 25% Moderately Dissected Fluvial Granitic, 15% Xeric Granitic Fluvial, and 10% Steep granitic Canyon lands.

The Strongly Dissected Granitic Fluvial lands are located on high elevation sites with dominant slope gradients from 50 to 75 percent. These landscapes include steep, sharp ridges and sharp draws that dissect the slope at relatively close intervals. Bedrock underlying these landscapes is dominantly granitics in weathering class 4 to 6. Soils are shallow to moderately deep and generally have sandy or coarse loamy textures with some skeletal when bedrock is less weathered. These soils are classified as Lithic and Typic Cryochrepts, Cryorthents and Cryumbrepts. The dominant potential natural vegetation is Douglas fir habitats.

The Moderately Dissected Fluvial Granitic lands are located on mid elevation sites with dominant slope gradients from 30 to 60 percent. These landscapes include slopes in a more highly weathered bedrock than the strongly dissected lands. The primary soils are moderately deep to deep coarse loamy to sandy. These soils are classified as Typic Cryumbrepts and Cryochrepts. The dominant potential natural vegetation is Douglas fir.

The Xeric Fluvial lands are located on low elevation sites with dominant slope gradients from 30 to 60 percent. These landscapes are typically treeless and are warm and bare of snow most of the year. The primary soils are moderately deep, and coarse loamy in texture. These soils are classified as Typic Xerochrepts and Xerorthents. The dominant potential natural vegetation is sagebrush habitats.

The Steep Granitic Canyon lands are located on mid elevation sites with dominant slope gradients from 60 to 80 percent. These landscapes include the steep canyon walls along the major drainages. The parent material is granitic. The primary soils are shallow to moderately deep and have coarse loamy or sandy textures and are often skeletal. These soils are classified as Lithic and Typic Xerorthents and Cryorthents. The dominant potential natural

vegetation is Douglas fir and Ponderosa Pine habitats.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Ahh Middle Fork Payette Canyon

Location: This subsection is located in the South Fork Payette River Basin of west central Idaho.

Subsection Concept: This subsection consists of steep dissected mountain slopes of quartz monzonite, and granodiorite that have been modified by glaciation and frost churning. The major general vegetative types include Douglas fir, ninebark, spirea, pinegrass, and elksedge. This map unit is separated from similar subsections based upon steep dissected mountain slopes, and recent uplift which may even be going on now.

Subsection Setting and General Characteristics: These cryic mountains have an elevation range of 4000 to 7500 feet/1220 to 2286 meters. The dominant slope range is 20 to 65 percent. The dominant types of rocks are quartz monzonite in the east, granodiorite in the west, and minor dike swarms, and in the southwest are found aplites, pegmatites and quartz diorite. The primary geomorphic processes in these landscapes are glacial, frost churning, faulting and uplifting in the drainages.

Mean annual precipitation ranges from 25 inches/64 cms near Crouch to 50 inches/127 cms in the higher elevations. Most precipitation occurs in the winter with 80 percent of the precipitation falling as snow. The mean annual air temperature is 27 degrees F/-2 degrees C.

The drainages are generally deeply incised indicating a response to changes in base levels caused by faulting and uplift. The entrenchment of the Middle Fork near Railroad Pass gives some evidence that some of the lands at the present head of the Middle Fork of the Payette may have drained into the headwaters of the South Fork of the Salmon River. The middle and upper quarter of the main drainage, along with the lower third of Silver Creek and most of the tributary drainages like Anderson and Bulldog Creeks, are deeply entrenched on the landscape.

The primary natural disturbance processes are faulting, glaciation and fire. Human-caused disturbances include hot springs recreation sites.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 50% Strongly dissected granitic fluvial lands, 20% glaciated trough lands, and 15% cryic uplands.

The strongly dissected granitic fluvial lands are located on mid elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include steep mountain slopes and peaks that are formed in granitic parent material. The primary soils are shallow to moderately deep coarse to moderately coarse textured. These soils are classified as Lithic and Typic Cryorthents. The dominant potential natural vegetation is Douglas fir habitats.

The Glaciated Trough lands are located on high elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include Bull Creek and other drainages that are formed in granitic parent material. The primary soils are moderately deep to deep coarse to moderately coarse textured. These soils are classified as Lithic and Typic Cryorthents. The dominant potential natural vegetation is subalpine fir habitats.

The Cryic Uplands are located on high elevation sites with dominant slope gradients from 20 to 40 percent. These landscapes have smooth, relatively undissected features characteristic of frost churned slopes formed in granitic parent material(s). The primary soils are moderately deep and deep coarse to moderately coarse textured. These soils are classified as Typic Cryorthents. The dominant potential natural vegetation is lodgepole and subalpine fir

habitats.

The area as a whole has a naturally high sediment production capacity. There are many hot springs in the area and it has roadless area qualities.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Aii Bear Valley, Landmark Basin and Uplands

Location: This subsection includes the the East Fork, South Fork and Middle Fork of the Salmon River, and to the south, the South Fork Payette River of central Idaho.

Subsection Concept: This subsection consists of broad, deeply filled valleys and rolling uplands of quartz monzonite, and granodiorite in the north that have been modified by fluvial processes and frost churning. The major general vegetative types include Lodgepole pine, Subalpine fir. This map unit is separated from similar subsections based upon the extent of the glacial valley system surrounded by high mountains. It is an important anadromous fisheries drainage.

Subsection Setting and General Characteristics: These valleys and uplands have an elevation range of 6600 to 8000 feet/2012 to 2438 meters. The dominant slope range is 10 to 40 percent. The dominant types of rocks are quartz monzonite, and granodiorite in the north. The primary geomorphic processes in these landscapes are fluvial, with frost churning, glaciated, and block faulting.

Mean annual precipitation ranges from 25 inches/64 cms in the valleys to 60 inches/152 cms in the higher mountains. 75 percent of annual precipitation occurs during November through April. Snow packs present on April 1 account for 60 percent of mean annual precipitation. The snow pack is among the highest in the state. Almost the entire area is snow covered between December and April. It is also one of the coldest places in the state. The mean annual air temperature is 36 degrees F/2 degrees C.

Streams meander through the valleys. The landscape up from the valleys is slightly dissected. Some of the meadows are wet year-round. Bull Lake and others occur in the moraines and high cirques.

The primary natural disturbance processes are stream course altering. Human-caused disturbances include grazing and mining.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include 30% Strongly Glaciated Land, 10% Fluvial Lands, 10% Depositional lands, and 30% Cryic uplands.

The glaciated lands are located on high elevation sites with dominant slope gradients from 30 to 75 percent. They make up about 20 percent of the subsection. These landscapes include cirques and troughs that are formed in granitic parent material. The primary soils are Shallow to deep, with sandy skeletal textures. These soils are classified as Lithic and Typic Cryochrepts and Lithic cryorthents. The dominant potential natural vegetation is subalpine fir communities.

The fluvial lands are located on mid elevation sites with dominant slope gradients from 40 to 60 percent. These landscapes include mountain slopes that are formed in granitic parent material. The primary soils are moderately deep, loamy and sandy skeletal. These soils are classified as Typic Crumbrepts and cryochrepts. The dominant potential natural vegetation is Douglas fir and subalpine fir.

The depositional lands are located on low elevation sites with dominant slope gradients from 5 to 25 percent. These make up 20 percent of the subsection. These landscapes include the dry and wet meadows that are formed in valley deposits from fluvial and glacial activities. The primary soils are deep sandy skeletal or loamy skeletal. These soils are classified as Typic cryochrepts and cryumbrepts. The dominant potential natural vegetation is sedge and willow communities.

The cryic uplands are located on high elevation sites with dominant slope gradients from 20 to 50 percent. 35 percent of the subsection is in this land type. These landscapes include smooth frost churned uplands that are formed in glacial moraines and granitic parent materials. The primary soils are moderately deep to deep, sandy and sandy skeletal. These soils are classified as Typic cryumbrepts and cryochrepts. The dominant potential natural vegetation is lodgepole and subalpine fir communities.

The Bear Valley is recognized for it's unique character and it's importance to anadromous fisheries. Headwater for the Middle Fork of the Salmon River originates in this subsection. There has been a major rehabilitation project on the Big Meadows Dredging and rare earth mine sites. Deadwood Reservoir and the Frank Church No Return Wilderness are in the subsection.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Ajj Upper South Fork Salmon River

Location: This subsection is located in the South Fork of the Salmon River and a portion of the North Fork of the Payette River of central Idaho.

Subsection Concept: This subsection consists of the Warm Lake Basin and associated ridges of quartz monzonite that have been modified by glaciation and faulting. The major general vegetative types include lodgepole, subalpine fir, and marsh communities. This map unit is separated from similar subsections based upon the broad basin and the weathering class of the parent material. The broad flat valley also accumulates considerable cold air throughout the year which is an important factor.

Subsection Setting and General Characteristics: These river headlands have an elevation range of 5000 to 8000 feet/1600 to 2600 meters. The dominant slope range is 5 to 20 percent in the valley and 40 to 70 percent on the mountain slopes. The dominant types of rocks are quartz monzonite. The primary geomorphic processes in these landscapes are glacial, fluvial, and faulting.

Mean annual precipitation ranges from 35 inches/89 cms in the basin to 45 inches/114 cms in the higher elevations. Most precipitation occurs in the winter with 80 percent of the precipitation falling as snow. This area is generally snow covered from anytime between October through April, with remnant snowpack existing past July 4, in the upper elevations. The mean annual air temperature is 38 degrees F/3 degrees C.

Streams which run into the South Fork are roughly 90 degrees to each other indicating that the streams are fault related. The fluvial slopes are well dissected. Marsh lands occupy the wettest terrestrial sites and lake margins. Warm Lake occurs in the middle of the basin.

The primary natural disturbance processes are fluvial and mass failures. Human-caused disturbances include recreational development and historical mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 15% of basin or depositional lands, 35% slopes into the basin, and 40% glaciated ridges and headlands.

The Warm Lake Basin is located on low elevation sites with dominant slope gradients from 5 to 20 percent. This basin includes lateral moraines. One of these moraines forms a natural dam which forms the lake. The primary soils are moderately deep loamy sand surfaces. These soils are classified as Typic cryochrepts and cryorthents. The dominant potential natural vegetation is lodgepole and subalpine fir communities.

The fluvial slopes are located on mid elevation sites with dominant slope gradients from 40 to 60 percent. These slopes are well dissected and are formed in quartz monzonite. The primary soils are moderately deep to shallow sandy to coarse loamy. These soils are classified as Typic and Lithic Cryorthents and Cryochrepts. The dominant potential natural vegetation is Douglas fir and subalpine fir. This is the farthest east reach for Grand fir.

The ridge systems are located on high elevation sites with dominant slope gradients from 40 to 75 percent. These landscapes include tilted block fault slopes, moraines, and frost churned areas that are formed in quartz monzonite weathering classes 2 to 4. The primary soils are deep to moderately deep with fine sandy loam surfaces, and shallow sandy loam soils on the ridges. These soils are classified as Typic and Lithic Cryochrepts and Cryorthents. The dominant potential natural vegetation is subalpine fir.

Warm Lake Recreation Complex is well visited. There is a Knox Ranch

Historical site. Stolle meadows is a very important spawning area for salmon.

Compiled By: Boise National Forest, Leah Juarros

M332Akk Long Valley Basin

Location: This subsection generally occupies the valley floor from near Smiths Ferry to Payette Lake in north central Idaho, about 50 miles in length and 8 to 10 miles in width. The area includes the east-facing slopes of West Mountain Ridge and the towns of Mc Call and Cascade.

Subsection Concept: This subsection consists of periglacial (frost churned) and fluvial mountain slopes that descend into a deeply-filled, fault block basin. Potential natural vegetation of the valley floor is dominated by seral stands of lodgepole pine and riparian communities where sites have not been altered with introduced species. Grand fir and Douglas fir series occupy low to middle elevation slopes above the cold air influence, and subalpine fir occurs on the upper slopes of West Mountain. This map unit is separated from similar subsections based upon soil parent materials and the extent of valley bottomland.

Subsection Setting and General Characteristics: The broad valley and mountain sideslopes have an average elevation range of 4800 to 7500 feet (~ 1460 to 2290 meters); Median elevation is about 5200 feet (~ 1580 meters). Dominant local relief is about 100 feet (~ 30 meters). Slope gradient ranges from 0 to 60 percent, dominantly 0 to 40 percent. The dominant lithology is glacial outwash and alluvial deposits in the valley basin, and Columbia River basalt with etamorphic and granitic intrusions on West Mountain. The mountain landscape has been shaped by faulting, weak glaciation and frost churning, and fluvial erosion processes. The valley basin has been faulted and subsequently filled by depositional processes.

Mean annual precipitation ranges from 25 inches (~ 64 centimeters) in the basin and lower foothills to 40 inches (~ 102 centimeters) in the uppermost elevations of glaciated and periglacial landscapes. Nearly 90 percent of the total precipitation falls as snow during October through April. Mean annual air temperature is 27 to 42 degrees F (~ minus 3 to plus 6 degrees Centigrade).

The landscape is highly dissected with a dendritic drainage pattern. Major streams and rivers include Clear Creek, Boulder Creek, Gold Fork River, and the North Fork of Payette River. Wet meadows and riparian reaches occur on low-gradient depositional landforms with poorly drained soils. This subsection contains numerous lakes and reservoirs; Payette Lake, Little Payette Lake, and Cascade Reservoir are three of the larger bodies of water.

The primary natural disturbance processes are insect and disease epidemics, stream course alterations, and fluvial erosion. The landscape is relatively stable due to gentle slope gradients over most of the map unit. Human-caused disturbances include urban and recreational development, agricultural farming, livestock grazing, timber harvest, and mining borrow pits.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Depositional Lands (about 75 percent of area), 2) Glaciated and Frost Churned) Mountain Slopes (about 10 percent of area), and 3) Fluvial Mountain Slopes (about 15 percent of area).

Depositional lands consist of moraines, outwash plains and alluvial landforms that have nearly level to moderately sloping gradients of 0 to 20 percent. Elevation ranges from 4800 to 5000 feet (~ 1460 to 1520 meters).

Glaciated Mountains are characterized by mountain peaks and ridges with average slopes of 40 to 80 percent and glacial troughs with U-shaped valley side slopes of 30 to 60 percent. Elevation ranges from about 6000 to 7500 feet (~ 1830 to 2290 meters).

Fluvial Mountain Slopes (30 to 50 percent) are characterized by dissected slopes with narrow ridges and V-shaped drainages formed by the erosive force of running water. Elevation ranges from approximately 5000 to 6000 feet (~ 1520 to 1830 meters).

Dominant soils are deep within the valley basin, and soil textures generally range from fine sandy to fine loamy. The depositional soils often have high water tables with mottled subsoil colors. Dominant soils on the mountain slopes of West Mountain are shallow to moderately deep with silt loam and loam textures. Soils are classified as Typic Cryoborolls and Cryumbrepts. Typic Cryaquolls, Cryaquepts, and aquic subgroups are associated with high water tables and poorly drained soils. Lithic subgroups are associated with sites near exposed bedrock on mountain sideslopes.

Potential natural vegetation of the valley basin is dominated by seral stands of lodgepole pine (Subalpine fir series) and riparian communities of mainly willows and sedges. Mixed conifer stands of Grand fir and Douglas fir series dominate the middle to lower mountain slopes above the cold air influence of the valley. Subalpine fir with interspersed stands of whitebark pine occur on the upper elevation slopes of West Mountain.

Compiled By: Payette National Forest; R. Jorgensen

M332All Long Valley Foothills

Location: This subsection occupies the west-facing foothills to the east of Long Valley (Payette Lake, Cascade Reservoir) and northeast of Round Valley in north central Idaho.

Subsection Concept: This subsection consists of periglacial (frost churned) uplands, glacial trough valleys, and basins that have been highly dissected by fluvial processes. Subalpine fir communities dominate the glaciated landscape in the eastern portion of the unit with Grand fir, Douglas fir, and seral lodgepole pine stands occurring at lower elevations near the valley floor. This map unit is separated from similar subsections based upon physiographic relationships and dissection of dominant landforms.

Subsection Setting and General Characteristics: These valleys and uplands have an average elevation range of 5000 to 8000 feet (~ 1520 to 2440 meters); Median elevation is about 6000 feet (~ 1830 meters). Dominant local relief ranges from 500 to 1000 feet (~ 150 to 300 meters). Slope gradient ranges from 0 to 80 percent, dominantly 15 to 40 percent. The dominant lithology is metamorphic rocks (e.g., gneisses, schists, and quartz diorite) and glacial outwash materials in the western portion of the unit which grade into granodiorite in the eastern portion. The upper-elevation trough valleys have been glaciated, whereas the low-relief uplands and basins have been shaped by structural control, frost churning and fluvial erosion processes.

Mean annual precipitation ranges from 25 inches (~ 64 centimeters) in the lower foothills and uplands to 40 inches (~ 102 centimeters) in the uppermost elevations of glacial landforms. Nearly 90 percent of the total precipitation falls as snow during October through April. Mean annual air temperature is 27 to 41 degrees F (~ minus 3 to plus 5 degrees Centigrade).

The landscape is highly dissected with a dendritic drainage pattern. Major drainages include Clear Creek, Corral Creek, Big Creek, Beaver Creek, and the Gold Fork River. Wet meadows and riparian reaches occur on low-gradient depositional landforms with poorly drained soils. Scattered lakes occur within glacial moraines and cirque basins at the higher elevations.

The primary natural disturbance processes are wildfire, insect and disease epidemics, stream course alterations, and mass wasting associated with snow or debris avalanches in some of the steeper drainages. The landscape is relatively stable due to moderate slope gradients. Human-caused disturbances include historical mining, timber harvest, recreational development, and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Glacial Trough Lands (about 15 percent of area), 2) Periglacial (Frost Churned) Uplands and Mountain Slopes (about 45 percent of area), and 3) Depositional Lands (about 40 percent of area).

Glacial Trough Lands (30 to 60 percent slopes) are characterized by U-shaped valley side that generally have glacial material deposited on them rather than stripped away. Elevation ranges from about 6000 to 8000 feet (~ 1830 to 2440 meters).

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation ranges from approximately 5500 to 7500 feet (~ 1680 to 2290 meters).

Depositional lands consist of moraines, outwash plains and alluvial landforms that have nearly level to moderately sloping gradients of 0 to 20 percent. Elevation ranges from 5000 to 7000 feet (~ 1520 to 2130 meters).

Dominant soils are shallow to moderately deep on glacially scoured lands associated with exposed bedrock, and soil textures consist of loams, sandy loams, and loamy sands. Moderately deep and deep soils occur on lower slopes of glacial troughs, valley bottoms and other depositional landscape positions within basins. Soil textures in these areas consist of loams and sandy loams. Soils are classified as Typic Cryopsamments, Cryoborolls, and Cryumbrepts. Lithic subgroups are associated with areas of exposed bedrock. Cryaquepts, Cryaquolls, and aquic subgroups are associated with poorly drained soils and high water tables.

Potential natural vegetation is dominated by the subalpine fir series. Relatively dense stands of Englemann spruce and seral lodgepole pine are commonly found on moderately sloping lands near valley bottoms and within basins. Grand fir and Douglas fir are generally occur below 6000 feet on warmer aspects. Riparian community types are associated with poorly drained soils and high water tables in lowland positions.

Compiled By: Payette National Forest; R. Jorgensen

M332Amm Fitsum Peak Glaciated Lands

Location: This subsection is located on a glaciated mountain ridge system in north central Idaho that lies between the Long Valley foothills (near Mc Call, Idaho) and the South Fork of the Salmon River canyonlands to the east.

Subsection Concept: This subsection consists of an extensive area of high-elevation mountain peaks, U-shaped glacial valleys, and interspersed cirque basins formed by the scouring action of alpine glaciers. Subalpine fir communities represent vegetation potentials of these landscapes. This map unit is separated from similar subsections based upon the extent and strong physiographic contrast of the dominant landforms.

Subsection Setting and General Characteristics: These strongly glaciated mountains have an average elevation range of 5000 to 9000 feet (~ 1520 to 2740 meters); Median elevation is about 7000 feet (~ 2130 meters). Dominant local relief ranges from 2000 to 3000 feet (~ 610 to 915 meters). Slope gradient ranges from 20 to 80 percent, dominantly 40 to 80 percent. Surface geology is mainly Idaho Batholith granitics (e.g., quartz monzonite) which grades into metamorphosed granitic rocks (e.g., quartz diorite, quartz diorite gneiss) in the western portion of the unit. These glaciated lands were formed by the scouring action of alpine glaciers.

Mean annual precipitation ranges from 30 inches (~ 76 centimeters) in the lower elevation uplands to 60 inches (~ 152 centimeters) in the upper mountain peaks. Nearly 90 percent of the total precipitation falls as snow during October through April. Winter rain is mostly absorbed by the snowpack. Mean annual air temperature is 24 to 40 degrees F (~ minus 5 to plus 4 degrees Centigrade).

These lands are high water producers. Deep snowpack and high precipitation provide continual water yield to perennial streams. The east slopes drain into the Secesh River on the South Fork of the Salmon River, and the west slopes drain into the North Fork of the Payette River. Surface runoff is high on glacially scoured landforms that contain extensive areas of exposed bedrock. Moderate to highly dissected trough lands have concave slopes that return most precipitation as subsurface and ground water flows. Cirque basins commonly contain small lakes and wet meadows that store water for sustained year-long flows.

The primary natural disturbance regimes include wildfire, insect and disease epidemics, and mass wasting processes associated with snow and debris avalanches. Glacially scoured areas remain relatively stable due to high percentages of exposed bedrock and surface rock fragments. Deep snows and steep slopes contribute to the high avalanche hazard, and some drainages show evidence of past debris slides. Harsh climatic conditions, fragile soils, and steep slopes limit productivity and management opportunities. Human-caused disturbances include timber harvest on boundary fringes, recreation trails, and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Glacial Headlands and Cirque Basins (about 50 percent of area), 2) Glacial Trough Lands (about 25 percent of area), and 3) Periglacial Uplands and Mountain Slopes (about 15 percent of area). The remaining 10 percent of the area is comprised of glacial moraines and some alluvial landforms in lowland positions such as valley bottoms and stream terraces.

Glacial Headlands and Cirque Basins are characterized by steep, rugged mountain summits with average slope gradients of 40 to 80 percent, and ice-scoured cirque basins with moderate slopes of 10 to 40 percent. Elevation ranges from approximately 6500 to 9000 feet.

Glacial Trough Lands (30 to 60 percent slopes) are characterized by U-shaped valley side slopes that generally have glacial material deposited on them rather than stripped away. Elevation ranges from about 5500 to 8000 feet.

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and smooth mountain slopes that reflect the localized effects of glaciation. Elevation ranges from approximately 5500 to 7500 feet.

Weakly developed soils are interspersed between extensive areas of exposed bedrock. Dominant soils are shallow to moderately deep with soil textures consisting of loams, sandy loams, and loamy sands. Deep soils are associated with lower footslopes of glacial troughs and depositional landforms. Soils are classified as Typic and Lithic Cryorthents, Cryopsamments, Cryochrepts and Cryumbrepts. Lithic subgroups are associated with glacially scoured areas near exposed bedrock.

Potential natural vegetation is dominated by the subalpine fir series. Sparse stands of subalpine fir/whitebark pine occur with grass/forb openings at the upper elevations. Relatively dense stands of Englemann spruce and seral lodgepole pine are commonly found on moderately sloping lands such as cirque basins and near valley bottoms. Riparian community types are associated with poorly drained soils and high water tables in lowland positions.

Compiled By: Payette National Forest; R. Jorgensen

M332Ann Burgdorf Basin

Location: This subsection is located on an uplifted basin and upland area in north central Idaho near Burgdorf. The area encompasses portions of the Secesh and Warren drainages south of the Salmon River Canyon.

Subsection Concept: This subsection consists of a structurally controlled basin and rolling uplands that reflect the localized effects of glaciation and fluvial geomorphic processes. Subalpine fir communities dominate the landscape with Grand fir and Douglas fir occurring at lower elevations on warmer aspects. This map unit is separated from similar subsections based upon the physiographic and structural relationships of dominant landforms. The Burgdorf area is generally more dissected and has greater relief than two similar units; Chamberlain Basin across the South Fork of the Salmon River and the Red River Basin across the main Salmon River to the north.

Subsection Setting and General Characteristics: The landscape has an average elevation range of 5100 to 8600 feet (~ 1550 to 2620 meters); Median elevation is about 6800 feet (~ 2070 meters). Dominant local relief ranges from 1500 to 2000 feet (~ 460 to 610 meters). Slope gradient ranges from 0 to 80 percent, dominantly 15 to 40 percent. The dominant lithology is Idaho Batholith granitics that grade from quartz diorite in the west into coarse quartz monzonite in the east. Metamorphic rocks (e.g., gneisses, schists, and quartzites) occur mainly in the northern portion of the unit. The upper-elevation mountain portions have been glaciated, whereas the low-relief basin and upland landscapes have been shaped by structural control, frost churning and fluvial erosion processes.

Mean annual precipitation ranges from 25 inches (~ 64 centimeters) in the lower elevation uplands and basins to 40 inches (~ 102 centimeters) in the glaciated mountains of this subsection. Higher elevations may receive up to 50 inches (127 centimeters) in localized areas. Nearly 90 percent of the total precipitation falls as snow during October through April. Mean annual air temperature is 25 to 40 degrees F (~ minus 4 to plus 4 degrees Centigrade).

The landscape is moderately dissected with streams and rivers (e.g., Warren Creek, Secesh River) that meander through the glacial-fluvial deposits in the central portion of the unit. Wet meadows and riparian reaches occur on low-gradient depositional landforms with poorly drained soils. Lakes are a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and mass wasting associated with snow or debris avalanches in some of the steeper drainages of glaciated and fluvial mountains. The landscape is relatively stable due to moderate slope gradients and high percentages of surface rock fragments. Geologic erosion processes generally replace materials which may have been removed, and net balance is maintained. Human-caused disturbances include historical and current mining activities, timber harvest, livestock grazing, recreational development, and private land development.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings; 1) Glaciated Mountains (about 30 percent of area), 2) Periglacial (Frost Churned) Uplands and Mountain Slopes (about 35 percent of area), 3) Fluvial Uplands and Basins (about 25 percent of area), and 4) Depositional Lands (about 10 percent of area).

The Glaciated Mountain landscapes are characterized by high-elevation mountain peaks with average slopes of 40 to 80 percent, glacial trough sideslopes of 30 to 60 percent, and ice-scoured cirque basins with moderate slopes of 10 to 40 percent. Elevation ranges from approximately 6000 to 8600 feet (~ 1830 to

2620 meters).

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation ranges from approximately 5500 to 7500 feet (~ 1680 to 2290 meters).

Fluvial Uplands and Basins (30 to 50 percent gradient) are characterized by structurally controlled uplands and basins with finely-meshed dendritic drainage patterns. These landforms are often described as old erosion surfaces that have been uplifted to their current elevation. Elevation ranges from approximately 5100 to 6500 feet (~ 1550 to 1980 meters).

Depositional lands consist of moraines, outwash plains and alluvial landforms that have nearly level to moderately sloping gradients of 0 to 20 percent. Elevation ranges from 5100 to 7000 feet (~ 1550 to 2130 meters).

Dominant soils are shallow to moderately deep on glacially scoured lands, with soil textures consisting of loams, sandy loams, and loamy sands. Moderately deep and deep soils are associated with lower slopes of glacial troughs, valley bottoms and other depositional landscape positions within the basin. Soil textures in these areas consist of loams, silt loams, and sandy loams. Soils are classified as Typic and Lithic Cryorthents, Cryopsamments, Cryochrepts and Cryumbrepts. Lithic subgroups are associated with glacially scoured areas near exposed bedrock. Cryaquepts and aquic subgroups are associated with poorly drained soils and high water tables. On low-elevation fluvial lands (below 5500 feet), soils are dry (xeric) with cool soil temperatures; Xerorthents and Haploxerolls are representative in these areas.

Potential natural vegetation is dominated by the subalpine fir series. Sparse stands of subalpine fir/whitebark pine occur at the upper elevations. Grand fir and Douglas fir are generally occur below 6000 feet on warmer aspects. Relatively dense stands of Englemann spruce and seral lodgepole pine are commonly found on moderately sloping lands within the basin. Riparian community types are associated with poorly drained soils and high water tables in lowland positions.

Compiled By: Payette National Forest; R. Jorgensen

M332Aoo Granite Mountain Uplands

Location: This subsection is located on a strongly-glaciated upland area in north central Idaho that lies south of the Salmon River Canyon, east of the Little Salmon River Canyon and north of Payette Lake near Mc Call, Idaho.

Subsection Concept: This subsection consists of glacially scoured and frost churned uplands, glacial trough valleys, and depositional landforms that generally follow fault-directed drainage patterns. Subalpine fir communities best represent vegetation potentials with minor areas of mixed conifer (Douglas fir series) at lower elevations. This map unit is separated from similar subsections based upon the physiographic contrast of these moderately steep landforms and differences in bedrock lithology.

Subsection Setting and General Characteristics: These glaciated uplands have an average elevation range of 4000 to 8600 feet (~ 1220 to 2620 meters); Median elevation is about 6400 feet (~ 1950 meters). Dominant local relief ranges from 1500 to 2500 feet (~ 460 to 760 meters). Slope gradient ranges from 0 to 80 percent, dominantly 15 to 40 percent. The dominant lithology is metamorphic rocks (e.g., gneissic quartz diorite, gneissic quartz monzonite). Columbia River basalts occur in the western portion at Lava Butte and north from Hazard Creek to Rattlesnake Creek. The mid to upper-elevation landforms were formed by the scouring action of alpine glaciers. The periglacial uplands, fluvial mountains, and depositional landforms were formed by faulting and uplift, frost churning, fluvial erosion and depositional processes.

Mean annual precipitation ranges from 25 inches (~ 64 centimeters) in the lower elevation fluvial landscapes to 45 inches (~ 114 centimeters) in the glaciated mountains and uplands. Higher elevations may receive up to 50 inches (127 centimeters) in localized areas. Nearly 90 percent of the total precipitation falls as snow during October through April. Mean annual air temperature is 25 to 44 degrees F (~ minus 4 to plus 7 degrees Centigrade).

These lands are high water producers, and the landscape is moderately dissected with entrenched tributaries that follow fault zones with north-south structural orientation. Wet meadows and riparian reaches with high water tables occur on low-gradient depositional landforms throughout much of this subsection. Upper Payette Lake, Hazard Lakes, Goose Lake and Brundage Reservoir are some of the larger bodies of water that occur in this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and snow avalanches or debris slides in some of the steeper drainages of glaciated and fluvial mountains. The landscape is relatively stable due to moderate slope gradients and high percentages of surface rock fragments. Human-caused disturbances include historical and current mining activities, timber harvest, recreational development, and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings; 1) Glaciated Mountains and Uplands (about 55 percent of area), 2) Periglacial (Frost Churned) Uplands (about 20 percent of area), 3) Fluvial Mountains and Steep Canyonlands (about 10 percent of area), and 4) Depositional Lands (about 15 percent of area).

The Glaciated Mountains and Uplands are characterized by high-elevation mountain peaks with average slopes of 40 to 80 percent, glacial trough sideslopes of 30 to 60 percent, and ice-scoured cirque basins with moderate slopes of 10 to 40 percent. Elevation ranges from approximately 6000 to 8600 feet (~ 1830 to 2620 meters).

Periglacial Uplands (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation

ranges from approximately 5500 to 7500 feet (~ 1680 to 2290 meters).

Fluvial Mountains and Steep Canyonlands (30 to 80 percent gradient) are characterized by dissected mountain slopes with V-shaped drainages and steep canyon escarpments at low to mid elevations of 4000 to 6500 feet (~ 1220 to 1980 meters).

Depositional lands consist of moraines, outwash plains and alluvial landforms that have nearly level to moderately sloping gradients of 0 to 20 percent. Elevation ranges from 5000 to 7000 feet (~ 1520 to 2130 meters).

Dominant soils are shallow to moderately deep on glacially scoured lands and fluvial lands, with soil textures consisting of loams, sandy loams, and loamy sands. Moderately deep and deep soils are associated with lower slopes of glacial troughs, valley bottoms and other depositional landscape positions. Soil textures in these areas consist of loams and sandy loams. Soils are classified as Typic and Lithic Xerorthents and Xeropsamments, and Ultic and Lithic Ultic Haploxerolls on low-elevation fluvial lands with dry (xeric) aspects and cool soil temperatures. Typic and Lithic Cryorthents, Cryopsamments, Cryochrepts and Cryumbrepts are found on moist, cold (cryic) sites at mid to upper elevations. Lithic subgroups are associated with glacially scoured areas near exposed bedrock. Typic Cryaquepts and Cryaquolls are associated with poorly drained soils and high water tables.

Potential natural vegetation is dominated by the subalpine fir series. Sparse stands of subalpine fir/whitebark pine occur at the upper elevations. Relatively dense stands of Englemann spruce and seral lodgepole pine are commonly found on moderately sloping lands such as cirque basins and valley bottoms. Grand fir and Douglas fir are generally occur below 6000 feet on warmer aspects. Minor areas of Ponderosa pine and shrub/grass communities occur at low elevations on dry aspects of Fluvial mountains. Riparian community types are associated with poorly drained soils and high water tables in lowland positions.

Compiled By: Payette National Forest; R. Jorgensen

M332App Middle Fork Boise Canyon

Location: This subsection is located in the Boise River Basin of Central Idaho.

Subsection Concept: This subsection consists of deep entrenched, canyon like characteristics, and in the upper South Fork, a basin surrounded by cryic ridges of granite with some common intrusive dikes and igneous rhyolitic outcrops that have been modified by frost churning, and fluvial processes. The major general vegetative types include bitterbrush/subalpine big sage, Bitterbrush/cherry and Douglas fir. In the upper South Fork, vegetative types include sagebrush/grass, mountain snowberry, subalpine big sage, Ponderosa Pine, and Douglas fir. This map unit is separated from similar subsections by its structural control, plus the high volume runoff energy sources from the deep snow peaks, determine the deeply stream entrenched and canyon like characteristics.

Subsection Setting and General Characteristics: These canyon and stream cut lands have an elevation range of 4000 to 9740 feet/1220 to 2970 meters. The dominant slope range is 45 to 65 percent in the Middle Fork and 15 to 45 percent in the Upper South Fork. The dominant types of rocks are granitic. The primary geomorphic process in these landscapes are fluvial

Mean annual precipitation ranges from 15 inches/37 cms in the southern part of the area to 50 inches/123 cms in the Steele Mountain-Trinity Ridge area. Most precipitation occurs in the winter with 80 percent of the precipitation falling as snow. The mean annual air temperature is 40 to 66 degrees F/4.4-19 degrees C.

The major streams are bordered by oversteepened canyons.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include recreation hot springs and river access, Arrowrock reservoir, and grazing.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include 40% Strongly dissected fluvial lands that are xeric and 35% fluvial lands that are wetter. There is also 10% frost churned landscapes, and 10% oversteepened canyon lands.

The Strongly dissected fluvial lands are located on mid elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include the deeply incised mountain slopes that are formed in granitic parent material(s). The primary soils are moderately deep to deep moderately coarse textured with considerable amounts of coarse fragments. These soils are classified as Typic Cryorthents and Xerorthents. The dominant potential natural vegetation is shrub and Douglas fir habitats.

The frost churned landscapes are located on high elevation sites with dominant slope gradients from 25 to 45 percent. These landscapes include the Trinity Sunset Crooked River and Thorn Creek ridges of granitic parent material(s). The primary soils are moderately deep to deep and coarse skeletal in texture. These soils are classified as Typic Cryumbrepts and Cryorthents. The dominant potential natural vegetation is Douglas fir.

The oversteepened canyons are located on low elevation sites with dominant slope gradients over 55 percent. The primary soils are shallow and coarse textured. These soils are classified as Lithic Xerorthents and Xeropsamments. The dominant potential natural vegetation is brush land.

There is important winter range for big game and unroaded portions. A lot of recreation around the reservoir and hot springs adds to the use of the area.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Aqq Smiths Prairie Lowlands

Location: This subsection is located in the Boise River Basin of central Idaho.

Subsection Concept: This subsection consists of volcanic flow lands of Snake River Basalt flows and older, more silicic flows of the Pliocene Epoch underlain by granitics of the Atlanta granodiorite. The Danskin mountains included in this subsection represent the granodiorite. The major general vegetative types include brush/grass community with mountain big sage/blue bunch wheatgrass, bitterbrush/blue bunch wheatgrass, PSME/MAVA. This map unit is separated from similar subsections based upon climatic characteristics. Less than 30 percent of the area is timbered and xeric soils dominate the southern slopes. Annual precipitation is less than 20 inches. The area contains most of the volcanic flow lands of the South Fork of the Boise River.

Subsection Setting and General Characteristics: These volcanic flows have an elevation range of 3500 to 7500 feet/1060 to 2290 meters. The dominant slope range is 5 to 60 percent. The dominant types of rocks are silicic volcanic, basalt, underlain by granitics. The primary geomorphic process in these landscapes are fluvial with remnants of volcanic flows, deep dissected canyons with naturally dissected granitic slopes. The Danskins range in elevation from 4000 to 6000 feet/1200 to 2000 meters. Slopes range from 45 to 65 percent. The steep highly erodible slopes are Atlanta Granodiorite.

Mean annual precipitation ranges from 12 inches/32 cms in the Danskins to 25 inches/64 cms in isolated areas. Most precipitation occurs in the winter and spring with only 40 percent of the precipitation falling as snow. The mean annual air temperature is 36 to 64 degrees F/2.2 -17.8 degrees C.

The Danskins are well dissected. When the streams reach the plain, they are concentrated into river entrenched basalt escarpments.

The primary natural disturbance processes are fire and mass wasting in the Danskins. Human-caused disturbances include suburban and recreational development and grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 40% fluvial slopes, 20% silicic volcanic lands, and 15% basalt plains.

The fluvial slopes are located on high elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include the steep well dissected slopes of the Danskins and surrounding foothills. The primary soils are moderately deep and range from coarse loamy to sandy skeletal. These soils exhibit little or no profile developments. These soils are classified as Typic Xerorthents, and Cryorthents. The dominant potential natural vegetation is subalpine big sagebrush with Douglas fir in some northern aspects.

The silicic volcanic lands are located on mid elevation sites with dominant slope gradients from 25 to 55 percent. These landscapes include steep highly dissected exposed and uplifted lands overlaying the granodiorite. The primary soils are moderately deep skeletal sandy clay loams. These soils are classified as Typic Cryumbrepts and Xerumbrepts. The dominant potential natural vegetation is subalpine big sagebrush with Douglas fir in some northern aspects.

The basalt plains are located on low elevation sites with dominant slope gradients from 10 to 30 percent. These landscapes include river entrenched basalt escarpment with some basalt rockland. The primary soils are shallow to deep with clay loam textures. These soils are classified as Lithic and Typic Haploxeralfs, Cryumbrepts, and Xeric psamments. The dominant potential

natural vegetation is subalpine big sagebrush.

Compiled By: Boise National Forest, Suzanne Inglis and Leah Juarros

M332Arr South Fork Clearwater Dissected Uplands

Location: This subsection is located in the South Fork Clearwater River basin of north central Idaho.

Subsection Concept: This subsection consists of a moderately dissected peneplain surface, entrenched and downcut, in a zone of transition from maritime to montane climatic influence. Geology is Miocene, Permian, Triassic, and Cretaceous igneous rock. Dry, mesic and subalpine forests dominate the landscapes. This map unit is separated from similar dissected uplands by degree of dissection and geology.

Subsection Setting and General Characteristics: These dissected uplands have an elevation range of 1600 to 7000 feet. The slope range is 10 to 60 percent. The dominant lithology is Miocene basalt, Seven Devil's volcanics, and Cretaceous granite. The primary geomorphic processes in these landscapes are fluvial action with colluviation, with debris torrents, surface erosion and slump earthflows shaping channels where entrenched channels abut rounded ridge remnants of the old surface.

Mean annual precipitation is 30 inches (76 cm) in the valley bottoms to 50 inches (127 cm) on the highest ridges. Most precipitation occurs in the winter and spring months. Above about 5000 feet elevation, more than half of the precipitation falls as snow. The mean annual air temperature ranges from 37 to 50 degrees F (3 to 10 degrees C).

The characteristic surface water features associated with this subsection include streams, river, and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occur in stream headlands. Wetlands represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics and mass movement. Natural fire regime at low elevations is of high to moderate frequency and low to mixed severity and moderate extent. At mid elevations, fire regimes are of moderate frequency, mixed to high severity and moderate to large extent. At high elevations fire regimes are of moderate to low frequency, mixed to high severity, and moderate to large extent.

Areas of steep slopes and complex lithology are most prone to mass wasting. Debris torrents are typically confined to low order streams on steep terrain, and debris avalanches and bedrock slides occur with channel downcutting along major streams. Slump earthflows occur in areas of high water tables. Fire suppression has altered plant community composition, pathogen activity, and fuel loadings. Mining and road building have altered erosion rates and sediment regimes from historic levels.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include stream breaklands and uplands, with inclusions of alpine glaciated lands at the highest elevations.

The breaklands and colluvial slopes are at low to mid elevations along streams and rivers. Slopes are 45 to 60 percent. The soils are formed in moderately well weathered residual and colluvial material, with volcanic ash influenced loess on north aspects. The primary soils are moderately deep to very deep silt loams and sandy loams. These soils are classified as Typic Dystrochrepts, Ultic Haploxerolls, and Andic Dystrochrepts. The dominant potential natural vegetation is Douglas-fir and grand fir series.

Uplands are at mid to high elevations, with slopes from 10 to 50 percent. These landscapes include rolling hills, convex slopes and broadly convex ridges. The soils are formed in moderately well weathered residual material and volcanic ash influenced loess. These soils are classified as Andic

Cryochrepts, Typic Vitricryands, and Andic Dystrochrepts. The dominant potential natural vegetation is grand fir and subalpine fir series.

Compiled by: Nez Perce NF, Pat Green

M332Axx Salmon River Canyonlands

Location: This subsection is located in the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of over steepened, V-shaped canyonlands and narrow, side drainages derived from granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists and some lower Belt Supergroup quartzite. This area has been modified by fluvial, colluvial, debris and torrents. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from a similar subsection to the west which includes species indicative of a strong maritime influence; such as, Grand fir and Pacific Yew. Adjacent subsections are less steep.

Subsection Setting and General Characteristics: These steep, V-shaped canyonlands has an elevation range of 2,500 to 9,500 feet/762-2896 meters. The dominate slope range is 60 to 90 percent. The dominant types of rocks are granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists and some lower Belt Supergroup quartzite. The primary geomorphic processes in these landscapes are fluvial, colluvial, debris and torrents.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon river bottoms to 30 inches (76cm) at the high mountains. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 31 F. to 57 degrees F. (-0.6 to 14 degrees C).

The Middle Fork and the Main Salmon River, lower Horse Creek, lower Panther Creek, lower Colson Creek, lower Spring Creek, lower Pine Creek, lower Squaw Creek, lower Indian Creek, lower Moose Creek and lower Dump Creeks occur within this area. The landscape is highly dissected. Wetlands occur in valley bottom locations associated with alluvial deposits.

The primary natural disturbance processes are fire, flooding, erosion, insects and disease. Occasional high rainfall intensities occur in the summer along the Main Salmon River. Human-caused disturbances include fire, recreation, forest management, old mining activities, rural/recreation development, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This includes over steepened V-shaped canyonlands.

The over steepened V-shaped canyonlands range from low to high elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite and quartz monzonite. Inclusions of wide alluvial bottoms along the Salmon River consists of terraces and floodplains. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams and loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Psamments, Xerorthents, Haploxerolls, Cryoborolls and Cryaquolls in riparian areas. The dominant potential natural vegetation in shrublands on warm, south and west aspects at low elevation is mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, curl-leaf mountain mahogany and cottonwood trees. The dominant potential natural forest vegetation at mid elevation is ponderosa pine and bluebunch wheatgrass, Douglas-fir and Idaho fescue on the south & west aspects; at mid to high elevation is Douglas-fir, Idaho fescue, curl-leaf mountain mahogany, elk sedge, pinegrass, mountain snowberry, ninebark and at high elevation is subalpine fir, Whitebark Pine, ninebark, grouse whortleberry and mountain snowberry. Willows occur along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ayy Trinity Mountains

Location: This subsection is located in the Boise River basin of central Idaho.

Subsection Concept: This subsection consists of glaciated Idaho Batholith that has been modified by frost churning and fluvial processes. The major general vegetative types is a transition from ponderosa pine to lodgepole and subalpine fir . This map unit is separated from similar subsections based upon the fact that this is the southern reach of glaciation in the Idaho Batholith.

Subsection Setting and General Characteristics: These southern Batholith, and fluvial lands have an elevation range of 4500 to 9500 feet/1370 to 2895 meters. The dominant slope range is 30 to 60 percent. The dominant types of rocks are granite, weathering class 4 and 5. The primary geomorphic process in these landscapes are fluvial granitics, cryic uplands actively eroding and fluvial wet and dry creep.

Mean annual precipitation ranges from 25 inches/61 cms to 60 inches/147 cms. This area has the highest amount of precipitation in the section. Most precipitation occurs in the winter with 50 percent of the precipitation falling as snow in the lower areas and 75% falling as snow in the high mountains. The mean annual air temperature is 43 degrees F/6 degrees C.

The unit is drained by the headwaters of Smith Creek and Fall Creek. There is moderate to strong dissection.

The primary natural disturbance processes are fire, insects, and disease. Human-caused disturbances include recreation, grazing, logging and mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include 25% cryic uplands and 50% moderately to strongly dissected fluvial slopes. Only 10% is glaciated.

The cryic uplands are located on high elevation sites with dominant slope gradients from 50 to 60 percent. These landscapes include frost churned slopes that formed in granitic parent material(s). The primary soils are shallow to moderately deep with loamy skeletal textures. These soils are classified as Lithic and Typic Cryumbrepts, Cryoborolls, and Cryumbrepts. The dominant potential natural vegetation is brush and subalpine fir habitat types.

The moderately and strongly dissected fluvial slopes are located on mid elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include mountain slopes that are formed in granitic parent material(s). The primary soils are moderately deep moderately coarse and coarse textured. These soils are classified as Typic Cryorthents, Argic Algixerolls, and Ultic Haploxeralfs. The dominant potential natural vegetation is brush fields with small conifer patches.

There are many high mountain destination lakes in this subsection. The Rainbow Roaring Rivere and Trinity Lakes are among the premier recreation sites.

Compiled By: Boise National Forest, Leah Juarros

M332Azz Panther Creek Basin and Uplands

Location: This subsection is located in the Panther Creek Basin of Central Idaho, south of the Salmon River.

Subsection Concept: This subsection consists of dissected faulted uplands consisting of steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands. The bedrock consists of granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanic bedrock. This area is part of the Trans Challis Fault System and includes the Panther Creek graben. This area has been modified by fluvial, colluvial, frost churning and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which contain over steepened V-shaped canyons along lower Panther creek, on the west is higher elevation glaciated lands, on the south is rejuvenated streamcut mountains and canyonlands dominantly of volcanics, and on the east is where the Rocky Mountains meet the open Northern Rockies.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 8,000 feet/1524 to 2439 meters. The dominate slope range is 45 to 70 percent. The dominant types of rocks are granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 25 inches (64cm) in the canyon bottoms to 35 inches (89cm) at the higher elevations. Most precipitation on occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 36 F. to 48 degrees F. (2 to 9 degrees C).

Panther Creek, Camas Creek, Silver Creek, Napias Creek, Moose Creek, Blackbird Creek, Dump Creek and Moyer Creeks are the main ones, plus numerous other creeks occur within the area. The landscape ranges from slight to highly dissected. Wetlands and lakes occurs in locations associated with glacial-fluvial and alluvial deposits.

The primary natural disturbance processes are fire, erosion, windthrow, insects and disease. Human-caused disturbances include rural development, Blackbird cobalt mine (also in subsection M332Aqqq) is a superfund site (serious water quality problems due to heavy metals of copper, arsenic and cobalt from past mine operations), numerous old inactive mines, few current small active mines, one large open pit mine in construction; fire, livestock grazing, recreation, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite, quartzite monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanics. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, loamy sands and clay loams on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms.

These soils are classified as Psamments, Xerorthents, Haploxerolls, Cryorthents, Cryoborolls, Cryoboralfs and Argixerolls. The dominant potential natural vegetation in shrublands at low elevation is Wyoming big sagebrush, mountain big sagebrush, cottonwood trees, bluebunch wheatgrass and Idaho fescue. The potential natural forest vegetation is ponderosa pine and bluebunch wheatgrass on the south & west aspects from low to mid elevations; at mid elevation, cool sites are Douglas-fir, pinegrass, Idaho fescue and ninebark. Willows occur in the riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, loamy sands, silt loams, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Cryoboralfs, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The potential natural forest vegetation is ponderosa pine and bluebunch wheatgrass on the south and west aspects from low to mid elevations; at mid elevation, cool sites are Douglas-fir, pinegrass, Idaho fescue and ninebark. Willow occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams and loams. These soils are classified as Cryorthents, Cryumbrepts, Cryoborolls, and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands on south and west aspects is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, elk sedge, white spiraea at mid-elevation wetter sites and at the higher elevations are found subalpine fir, whitebark pine, grouse whortleberry, pinegrass, mountain snowberry, twinflower, bluejoint and beargrass. Willows are found along riparian areas.

The cryic basinlands range from mid to high elevation sites with dominant slope gradients from 30 to 60 percent. This landscape is subdued and the ridgetops are rounded that have been modified by frost action and drainage waters of glaciers and are formed in granite, quartz monzonite and volcanics. The primary soils are shallow to deep with textures of gravelly or rocky sandy loams, loams, clay loams and silt loams. These soils are classified as Cryorthents, Cryochrepts, Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, elk sedge, white spiraea at mid-elevation wetter sites and at the higher elevations are found subalpine fir, whitebark pine, grouse whortleberry, pinegrass, mountain snowberry, twinflower, bluejoint and beargrass. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in lower Belt Supergroup quartzite and volcanics. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts, Cryochrepts and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, elk sedge, white spiraea at mid-elevation wetter sites and at the higher elevations are found subalpine fir, whitebark pine, grouse whortleberry,

pinegrass, mountain snowberry, twinflower, bluejoint and beargrass. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in lower Belt Supergroup quartzite and volcanics. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts, Cryochrepts and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, Idaho fescue, elk sedge, white spiraea at mid-elevation wetter sites and at the higher elevations are found subalpine fir, whitebark pine, grouse whortleberry, pinegrass, mountain snowberry, twinflower, bluejoint and beargrass. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ba Bitterroot Glaciated Canyons

Location: This subsection is located in the Bitterroot River drainage of west-central Montana.

Subsection Concept: This subsection consists of uplifted mountains of igneous rock types associated with the Idaho Batholith that have been highly sculpted by glacial erosion. The major general vegetative types include dry and mesic coniferous forests. This map unit is separated from similar subsections based upon the heavy glaciation that occurred along the numerous parallel canyons.

Subsection Setting and General Characteristics: These glaciated mountains have an elevation range of 4000 to 10000 feet (1220 to 3050 meters). The dominant slope range is 50 to 80 percent. The dominant types of rocks are quartz monzonite, monzogranite, and granodiorite. In the northern part of this subsection the rocks are gneiss and schist. The eastern-most dip slope rocks are gneissic. The primary geomorphic process in these landscapes is glaciation.

Mean annual precipitation ranges from 14 inches/36 cms at the eastern portion of this unit to 70 inches/178 cms at the western ridge tops. A gradient from maritime to continental climates exists from west to east in this subsection. Most precipitation occurs in the winter and spring months with 60 percent of the precipitation falling as snow. The mean annual air temperature is (27 to 42 degrees F (-3 to 6 degrees C)).

Streams typically occur in glaciated canyon bottoms and in cirque floors. The landscape is moderately dissected. Wetlands occur in alluvium alongside the streams and as isolated alluvial basins within cirque floors and glacial moraine deposits in the canyon floor. Numerous lakes occur in the high elevation cirques.

The primary natural disturbance processes on droughty slopes is frequent low intensity underburning of the dry forests. On more moist slopes increased fuel accumulation, insects, and disease combine to cause moderate to severe fires on an infrequent basis. Large stand replacing fires are common in the east/west oriented canyons where strong westerly winds rapidly spread fire down the canyon. Underburning also occurs on the some east-facing mesic slopes along the Bitterroot Valley. Isolated, moderate size slump/earthflows occur in the schist rocks of the northern portion of the subsection. Human-caused disturbances mainly are confined to the eastern-most, nonwilderness dip slope of the mountain range and include timber harvest, moderate grazing, and occasional small to medium sized mines.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include heavily glaciated cirques, glacial trough walls, trough bottoms, and the east-facing dip slope.

The glacial cirques are located on high elevation ridges with dominant slope gradients from 25 percent to nearly vertical. These landscapes include cirque walls and floors that are formed in hard bedrock and glacial till. These landscapes are dominated by rock outcrop and talus. Where soils do occur they primarily are deep loamy sands overlain by volcanic ash and deep silt loams that are very poorly drained. These soils are classified as Andic Cryochrepts and Humic Cryaquepts. The dominant potential natural vegetation is subalpine fir, spruce, and whitebark pine/alpine larch forests.

The trough walls range from low to high elevation with dominant slopes of 50 to 80 percent. These landscapes include the trough walls and lateral glacial moraines. Overall, about one-half of the area is rock outcrop and talus. The soils on droughty sites are shallow and have sandy loam textures with high rock content. The soils on more moist sites are deep and have very cobbly

sandy loam textures, often overlain by volcanic ash caps. The shallow soils are Lithic Ustochrepts and the deep soils are Dystric and Andic Cryochrepts. The dominant potential vegetation is dry Douglas-fir and ponderosa pine on droughty sites and subalpine fir, mesic Douglas-fir, grand fir, and lodgepole pine on more moist slopes.

The trough bottoms are at the lower to middle elevations with dominant slopes of 5 to 30 percent. These landscapes include glacial moraines, stream terraces, and floodplains. The primary soils are deep and have extremely cobbly loamy sand to sand substrata overlain by loamy layers of alluvium and volcanic ash. Near the streams and alluvial basins soils are very poorly drained. The soils are classified as Andic and Dystric Cryochrepts and Typic Cryaquepts and Typic Cryaquepts. The dominant potential natural vegetation is moist Douglas-fir, grand fir, and spruce forest with significant amounts of willow and sedge riparian areas

The east-facing dipslope ranges from low to high elevations with dominant slopes of 40 to 60 percent. These landscapes include stream dissected mountain slopes and frost-churned ridgetops. The primary soils on droughty sites are shallow and have very cobbly sandy loam textures. On more moist sites the soils are deep and also have very cobbly sandy loam textures; many of them have a thin volcanic ash surface layer. The shallow soils are Lithic Argiborolls and Lithic Ustochrepts. The deep soils are Typic Ustochrepts, Dystric Cryochrepts, and Andic Cryochrepts. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir at lower elevations and on droughty slopes and subalpine fir, mesic Douglas-fir, and lodgepole pine at higher elevation moist slopes. Whitebark pine and alpine larch occur at the highest elevations of the unit.

Compiled By: Bitterroot NF; Ken McBride

M332Bb Bitterroot Tertiary Terraces

Location: This subsection is located in the Bitterroot Valley of west-central Montana.

Subsection Concept: This subsection consists of Tertiary stream terraces comprised of stratified layers of coarse to fine alluvium. Stream erosion has dissected these old terraces. The major general vegetative types include dry grasslands and shrublands. This map unit is separated from similar subsections based upon occurrence of extensive weathered stream deposits.

Subsection Setting and General Characteristics: These old terraces have an elevation range of 3600 to 4200 feet (1100 to 1280 meters). The dominant slope range is 5 to 30 percent. The dominant types of underlying material is clayey and sandy alluvium. The primary geomorphic process in these landscapes is stream erosion.

Mean annual precipitation ranges from 11 inches/28 cms to 14 inches/36 cms. Most precipitation occurs in the winter and spring months with 30 percent of the precipitation falling as snow. The mean annual air temperature is 45 to 50 degrees F (7 to 10 degrees C).

Only intermittent streams originate within the unit; however, streams that originate from adjacent mountains do traverse this unit. This landscape is moderately to highly dissected. Wetlands occur as very minor components alongside the perennial streams.

The primary natural disturbance processes are frequent low intensity grass and shrub fires. Human-caused disturbances dominate the landscape and include urban/suburban development, grazing, and gravel mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting- the Tertiary terraces.

The Tertiary terraces have dominant slope gradients of 5 to 30 percent on the "treads", but the narrow "scarps" have slope gradients up to 50 percent. The primary soils are deep and variable in texture, ranging from extremely cobbly sand to gravelly clay. These soils are classified as Typic Argiborolls and Typic Haploborolls. The dominant potential natural vegetation is bluebunch wheatgrass, rough fescue, and big sagebrush.

Compiled By: Bitterroot NF; Ken McBride

M332Bc East Fork Mountains

Location: This subsection is located in the East Fork of the Bitterroot River drainage in west-central Montana.

Subsection Concept: This subsection mainly consists of mountains formed by intrusion of granites of the Idaho Batholith and related large plutons. Stream erosion has been the dominant land-forming process. The major general vegetative types include coniferous forest and grassland. This map unit is separated from similar subsections based upon the combination of stream erosion and large contiguous area of intrusive bedrock.

Subsection Setting and General Characteristics: These stream eroded mountains have an elevation range of 3800 to 8800 feet (1160 to 2680 meters). The dominant slope range is 35 to 70 percent. The dominant types of rocks are granite but sizeable areas of borderzone gneiss and rhyolite also occur. The primary geomorphic process in these landscapes is stream erosion, but areas of localized glaciation do occur along the highest ridges.

Mean annual precipitation ranges from 16 inches/41 cms at the lowest elevations to 55 inches/140 cms at the highest elevations. Most precipitation occurs in the winter and spring months with 60 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 50 degrees F (-4 to 10 degrees C).

Streams typically occur on dissected mountain slopes and valleys. The East Fork of the Bitterroot River courses through a major valley, the upper portion of which was glaciated. The landscape is moderately to highly dissected. Wetlands occur as narrow bands along the streams. Along the East Fork River wetlands also occur as larger units associated with beaver activity. Alluvial basin wetlands occur in some of the highly weathered granitic lands and in glacial cirques. Lakes also occur in a few of the cirques.

The primary natural disturbance processes are frequent low intensity underburns on droughty slopes. On more moist slopes and valley bottoms, insect and disease plus higher biomass production cause more severe, less frequent fires that often are stand replacing. Human-caused disturbances include intensive timber harvest, grazing, and some mining. Residential development occurs along the East Fork and lower portions of a few major streams

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms and dissected uplands.

The valley bottoms are located on low to middle elevation sites with dominant slopes gradients from 5 to 20 percent. These include the large valley of the East Fork and the lower portions of major streams. These landscapes include floodplains and stream terraces that formed in outwash and alluvium. The primary soils are deep and typically have a loamy surface layer underlain by very coarse cobbly or gravelly sands and loamy sands. These valley bottom soils range from very poorly to excessively drained, depending on depth to water table. These soils are classified as Typic Cryochrepts and Typic Cryaquents. The dominant potential natural vegetation is Douglas-fir/ponderosa pine forest with areas of hydric spruce forest and willow/sedge riparian types.

The dissected uplands landscapes are located on the mountain slopes and ridges with dominant slope gradients of 35 to 80 percent. The landscapes include dissected steep mountain slopes and stream breaklands comprised of colluvium and residuum. The primary soils on droughty slopes are shallow and have very cobbly sandy loam to sandy clay loam textures. On more moist slopes the soils are deep and have very cobbly or very gravelly sandy loam to sandy clay loam

textures. Soils on north-facing slopes and on high ridges typically have a volcanic ash cap 4 to 8 inches thick. The shallow soils are Lithic Argiborolls and Lithic Ustochrepts. The deep soils are Typic Cryochrepts, Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryoboralfs. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir forest and dry grasslands on droughty slopes and mesic Douglas-fir, subalpine fir, and lodgepole pine on other slopes. The high elevation ridges have whitebark pine forest types.

Glacial cirques and troughs comprise a minor but significant portion of this unit at the highest elevations. Rock outcrop and talus dominate these landscapes. Soils are classified as Andic Cryochrepts and the vegetation is mainly subalpine fir, spruce, and whitebark pine.

Compiled By: Bitterroot NF; Ken McBride

M332Bd Anaconda and Flint Creek Ranges

Concept: This subsection consists of block faulted mountains with a heterogenous mixture of complexly folded and faulted sedimentary and igneous rocks ranging from the Precambrian to the Tertiary Period. They have been modified by ice cap and valley glaciation, and stream erosion. The major vegetation types are coniferous forests and mountain grasslands. This map unit is separated from similar subsections based upon the complex geology.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 4000 to 10,200 feet (1200 to 3100 meters). The slope range is 10 to 80 percent. Bedrock is a heterogenous mixture of igneous, sedimentary, and metasedimentary rocks. The primary geomorphic processes are glacial and fluvial.

Mean annual precipitation ranges from 11 inches (28 centimeters) at Drummond, Montana to 50 inches (127 centimeters) at the highest elevations. Most precipitation occurs in the spring and summer at the lower elevations with 10 percent of the precipitation falling as snow. At the highest elevations, most of the precipitation occurs in the winter and spring with 55 percent falling as snow. The mean annual temperature ranges from 33 degrees F to 45 degrees F (0.6 - 7 degrees C).

Perennial streams with the largest flows occur in the glaciated valleys while smaller perennial and intermittent streams occupy narrow, stream cut valleys. The granitic portion of the subsection is highly dissected and the remainder is moderately dissected. Wetlands are a significant component in the glaciated headlands and valleys but are a small part of the subsection. Lakes are common in cirque basins and occur locally in glaciated valleys.

The primary natural disturbance processes are fire, flooding, and mass failures. Human-caused disturbances include logging, grazing, mining, reservoirs, irrigation ditches, and urban/suburban development.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. They are glaciated ridges and basins, cirque basins and glacial troughs, and fluvial landscapes.

The glaciated ridges and basins are located at the highest elevations in the Flint Range with dominant slope gradients from 5 to 40 percent. This landscape has low relief glacially scoured ridges and basins that are formed in granitic bedrock. The primary soils are shallow and moderately deep sandy loams and loamy sands. The soils are classified as Lithic and Typic Cryochrepts and Cryorthents. The dominant potential vegetation is upper subalpine fir and timber line habitat type series. Rock outcrop and talus are significant components of this landscape.

The cirque basins and glacial trough landscape is located on mid to high elevation sites with dominant slope gradients from 15-60 percent. This landscape has cirque basins and glacial trough valleys that are formed in granitic, sedimentary, and metasedimentary rock. The primary soils are deep and shallow sandy loams and loams. They are classified as Typic and Lithic Cryochrepts. The dominant potential natural vegetation is upper subalpine, lower subalpine, and Douglas fir habitat type series. Rock outcrop and talus are significant components of the cirque basins and upper glacial troughs.

The fluvial landscape is located on mid and low elevation sites with dominant slope gradients of 20 to 45 percent. This landscape has stream dissected slopes and benches that are formed in a variety of sedimentary, metasedimentary and volcanic rocks. The primary soils are moderately deep loams, sandy loams, and clay loams. These soils are classified as Argic Cryoborolls, Typic Haploborolls, and Typic Cryochrepts and Cryoboralfs. The

dominant potential natural vegetation is rough fescue and Douglas-fir series.

Compiled by: Deerlodge National Forest, Dave Ruppert

M332Be Flint Creek and Upper Willow Creek Basins

Location: This subsection is located in the Clark Fork River Basin of southwestern Montana.

Subsection Concept: This subsection consists of structural basins with accumulations of Tertiary lacustrine deposits and Quaternary stream deposits that have been modified by stream erosion and mass wasting, and low relief uplands of Precambrian metasedimentary and Tertiary volcanic bedrock that have been modified by stream erosion. The dominant vegetative types are mesic and xeric coniferous forests and grasslands. This map unit is separated from similar subsections based upon the presence of coniferous forests and low relief uplands as major components.

Subsection Setting and General Characteristics: The basins and associated uplands have an elevation range of 4000 to 7000 feet (1230 to 2200 meters). The dominant slope range is 0 to 35 percent. The dominant types of rocks are Precambrian metasedimentary, Tertiary volcanic and sedimentary rocks and Quaternary alluvial deposits. The primary geomorphic processes are stream erosion and deposition, and mass wasting.

Mean annual precipitation ranges from 11 inches (28 centimeters) near the Clark Fork River to 20 inches (51 centimeters) at the highest elevations. Most precipitation occurs in the spring and summer with 10 to 30 percent of the precipitation falling as snow. The mean annual air temperature varies from 37 to 45 degrees F (3 to 7 degrees C).

Streams typically flow from narrow, V-shaped valleys in the metasedimentary and volcanic rock uplands. They flow into meandering, generally larger, streams in the basin bottoms where sizable riparian areas parallel the streams. Wetlands associated with seeps and springs are located on some of the terraces, on mass wasted landforms and along structural features. Sagponds occur on some of the mass wasted landforms. Wetlands are a significant component of the basins but are a minor component of the subsection.

The primary natural disturbance processes are fire, insects, disease, and flooding. Human caused disturbances include mining, logging, grazing, hay production, and urban/suburban development.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. They are basins and low relief uplands.

The basins are located on low and mid elevation sites with dominant slope gradients of 0 to 15 percent. This landscape consists of pediments, terraces, alluvial fans, and stream bottoms that have formed in Tertiary sedimentary rocks and Quaternary alluvium and colluvium. The primary soils are deep silt loams, loams, and gravelly loams. They are classified as Argic Cryoborolls and Typic Argiborolls, Haploborolls, and Cryoboralfs. The dominant potential natural vegetation is bluebunch wheatgrass, rough fescue, Douglas fir, and subalpine fir habitat type series.

The low relief uplands surround the basins and occur as isolated hills within the basins. They are located on low and mid elevation sites with dominant slope gradients of 10 to 35 percent. The uplands are stream dissected hills that are formed in quartzite, argillite, limestone, and volcanic bedrock. The primary soils are shallow and moderately deep, cobbly loams and sandy loams. They are classified as Typic and Lithic Haploborolls, Argiborolls, Cryoboralfs, and Cryochrepts. The dominant potential natural vegetation is bluebunch wheatgrass, rough fescue, Douglas fir, and subalpine fir habitat type series.

Compiled by: Deerlodge National Forest, Dave Ruppert

M332Bf Skalkaho Creek Calcic Mountains

Location: This subsection is located in the Bitterroot River drainage of west-central Montana.

Subsection Concept: This subsection consists of mountain slopes comprised of precambrian sedimentary rocks that have been modified by stream erosion and in the upper reaches by glaciation. The major general vegetative type is coniferous forest. This map unit is separated from similar subsections based upon the abundance of metamorphosed, precambrian, calcium bearing rocks, known locally as calc-silicates.

Subsection Setting and General Characteristics: These mountains have an elevation range of 4000 to 8800 feet (1220 to 2680 meters). The dominant slope range is 40 to 80 percent. The dominant types of rocks are calc-silicate and quartzite. The primary geomorphic processes in these landscapes are stream erosion and, in the upper elevations, glaciation.

Mean annual precipitation ranges from 13 inches/33 cms at the lowest elevations to 50 inches/127 cms along the high elevation ridgetops. Most precipitation occurs in the winter and spring months with 60 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 50 degrees F (-4 to 10 degrees C).

Streams typically occur on dissected mountain slopes and valleys. Skalkaho Creek courses through a major valley, the upper portion of which was glaciated. The landscape is moderately to highly dissected. Wetlands occur as narrow bands along the streams. Along Skalkaho Creek wetlands also occur as larger units associated with beaver activity. Alluvial basin wetlands occur in some of the high basins and in glacial cirques. Several lakes also occur in the cirques. Aquatic productivity is higher than the area average in this subsection due to the high levels of calcium and other bases derived from the calc-silicate rocks.

The primary natural disturbance processes are frequent low intensity underburns on droughty slopes. On more moist slopes and valley bottoms, insect and disease plus higher biomass production cause more severe, less frequent fires that often are stand replacing. Human-caused disturbances include intensive timber harvest, moderate grazing, and some mining for vermiculite. Residential development occurs along the lower portions of Skalkaho Creek.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms and dissected uplands.

The valley bottoms are located on low to middle elevation sites with dominant slope gradients from 5 to 20 percent. These include the large valleys of the Skalkaho and Daly Creeks and the lower portions of major streams. These landscapes include floodplains and stream terraces that formed in outwash and alluvium. The primary soils are deep and typically have a loamy surface layer underlain by very coarse cobbly or gravelly sands and loamy sands. These valley bottom soils range from very poorly to excessively drained, depending on depth to water table. These soils are classified as Aquic Cryochrepts and Typic Cryaquents. The dominant potential natural vegetation is Douglas-fir/ponderosa pine forest with areas of hydric spruce forest and willow/sedge riparian types.

The dissected uplands landscapes are located on the mountain slopes and ridges with dominant slope gradients of 40 to 80 percent. The landscapes include dissected steep mountain slopes and stream breaklands comprised of colluvium and residuum. The primary soils on droughty slopes are shallow and have very cobbly sandy loam to sandy clay loam textures. On more moist slopes the soils

are deep and have very cobbly or very gravelly sandy loam to sandy clay loam textures. Soils on north-facing slopes and on high ridges typically have a volcanic ash cap 4 to 8 inches thick. The shallow soils are Lithic Argiborolls and Lithic Ustochrepts. The deep soils are Typic Cryochrepts, Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryoboralfs. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir forest on droughty slopes and mesic Douglas-fir, subalpine fir, and lodgepole pine on other slopes. The high elevation ridges have whitebark pine forest types.

Glacial cirques and troughs comprise a minor but significant portion of this unit at the highest elevations. Rock outcrop and talus dominate these landscapes. Soils are classified as Andic Cryochrepts and the vegetation is mainly subalpine fir, spruce, lodgepole pine, and whitebark pine.

Compiled By: Bitterroot NF; Ken McBride

M332Bg Garnet Range

Location: This subsection is located between the Blackfoot and the Clark Fork Rivers in the Columbia River basin in Central Western Montana.

Subsection Concept: This subsection consists of dry, sloping to moderately steep residual mountains, glacial hills and moraines of precambrian belt, tertiary-age intrusive and extrusive igneous, and Mississippian and Cambrian limestone. The glacial material is formed from varied sources of mixed origins. These materials have been modified by colluvial and fluvial processes at the lower elevations and frost churning around the higher peaks. The major general vegetative types include coniferous forest with open lands that are from farming activities. This map unit is separated from similar subsections based upon geologic structure, parent material and elevational differences. This subsection is separated from adjacent ones by major river valleys.

Subsection Setting and General Characteristics: These residual mountains, glacial hills and moraines have an elevation range of 3200 to 7000 feet/985 to 2154 meters. The dominant slope range is 25 to 60 percent. The dominant types of rocks are precambrian belt, tertiary-age intrusive and extrusive igneous, and Mississippian and Cambrian limestone. The glacial material is formed from varied sources of mixed origins. The primary geomorphic processes in these landscapes are colluvial and fluvial processes at the lower elevations and frost churning around the higher peaks.

Mean annual precipitation ranges from 14 inches/36 cms in the river valleys to 32 inches/81 cms at the higher elevations. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 60 degrees F/-1 to 16 degrees C.

The area is bounded by the Blackfoot River to the north and the Clark Fork River on the south. Lakes and wetlands are generally absent from the area. The area is moderately dissected by stream channels. Streams and rivers typically occur in wide valleys with low gradients. Wetlands occur in the drainageways associated with the major rivers. A few reservoirs occur within the smaller tributaries.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include recreational development, logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include residual mountains and glacial features.

The residual mountains are located on mid to high elevation sites with dominant slope gradients from 40 to 60 percent. These landscapes include mountain slope, ridgetop and narrow valley landforms that are formed in precambrian belt, tertiary-age intrusive and extrusive igneous, and Mississippian and Cambrian limestone. The primary soils are shallow to moderately deep with textures of loam and sandy loam. These soils are classified as Cryoboralfs and Cryochrepts. The dominant potential natural vegetation is Ponderosa Pine and Douglas Fir on the dry sites with Douglas and Subalpine Fir on the wetter sites. Much of the Ponderosa Pine has been cutover.

The glacial features are located on low and mid elevation sites with dominant slope gradients from 25 to 50 percent. These landscapes include moraine and till plain landforms that are formed from varied sources of mixed origin parent material. The primary soils are deep and textures are loam and silt loam. These soils are classified as Eutroborealfs and Ustochrepts. The dominant potential natural vegetation is Ponderosa Pine and Douglas Fir on the dry

sites with Douglas and Subalpine Fir on the wetter sites. Much of the Ponderosa Pine has been cutover. Additionally, there are marsh areas in the depressions.

Compiled By: BLM Garnet Resource Area, Vito Celberti, Soil Scientist

M332Bh Rock Creek Uplands

Location: This subsection is located in the Rock Creek, Clark Fork, and Bitterroot River drainages of west-central Montana.

Subsection Concept: This subsection consists of mountain slopes and valleys mainly comprised of metamorphosed precambrian sedimentary rocks that have been modified by glaciation in the upper elevations and by stream erosion in the middle to low elevations. Frost-churning of ridgetops has also been a major land forming factor. The major general vegetative types include coniferous forests and dry grasslands. This map unit is separated from similar subsections based upon the predominance of precambrian, noncarbonatic sedimentary (belt) rocks.

Subsection Setting and General Characteristics: These belt mountains have an elevation range of 3300 to 8600 feet (1000 to 2620 meters). The dominant slope range is 35 to 80 percent. The dominant types of rocks are quartzite, argillite, and granite which occurs as isolated plutons. The primary geomorphic processes in these landscapes are glaciation in the upper elevations and stream erosion at middle and lower elevations.

Mean annual precipitation ranges from 14 inches/36 cms at the lower elevations to 55 inches/140 cms at the highest elevations. There is a trend toward increasingly continental climate from west to east across this unit. Most precipitation occurs in the summer and early fall months. At the higher elevations about 65 percent of the precipitation falls as snow, whereas in the Missoula area only about 40 percent falls as snow. The mean annual air temperature is 25 to 47 degrees F (-4 to 8 degrees C).

Streams occur in glacial cirque floors, glacial troughs, and small to medium mountain valleys. Rock Creek and the Clark Fork River course through large valleys. The landscape is moderately dissected. Wetlands occur as narrow bands in alluvium alongside streams and rivers and as beaver ponds. Wet meadow and forested wetlands occur in glacial till in the glacial cirque floors. The upper glaciated portions of Rock Creek and Burnt Fork Creek have a few small lakes.

The primary natural disturbance process is fire. On the droughty slopes frequent low intensity underburns maintain open stands of timber and grassland. On more moist slopes the higher biomass production combines with outbreaks of insects and diseases to produce high fuel loadings which often result in large areas of moderate to high intensity stand replacing fires. However periodic underburns do occur on the ridges. Human-caused disturbances include residential dwellings along the Clark Fork River and the lower reaches of Rock Creek. Timber harvest, light grazing, and light mining activity are the dominant impacts. A small designated wilderness and an unroaded wilderness study area occurs in this subsection.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, stream dissected mountain slopes, and high elevation glaciated uplands.

The valley bottoms are located on low to middle elevation sites with dominant slope gradients from 4 to 20 percent. These landscapes include floodplains, stream terraces, and toeslope landforms that are formed in alluvium and colluvium. The primary soils are deep extremely cobbly loamy sands and sands mostly overlain by thin layers of finer alluvium. These soils are classified as Aquepts, Aquepts, and Ochrepts. The dominant potential natural vegetation is moist Douglas-fir and subalpine fir on higher terraces and spruce and cottonwood community types on floodplains. Willow and sedge communities also occur as minor but ecologically significant components.

The dissected mountain slopes are located on valley slopes and ridges with dominant slopes of 40 to 80 percent. These landscapes include stream dissected mountain slopes and breaklands. The primary soils on droughty sites are shallow to moderately deep and have very cobbly sandy loam textures. They are classified as Lithic Ustochrepts and Typic Xerochrepts. On more moist slopes the soils are deep and have very cobbly sandy loam textures. These soils are classified as Typic Ustochrepts, Typic Cryochrepts, and Dystric Eutrochrepts. High elevation ridges in the western portion of this subsection often have a thin volcanic ash surface layer and are classified as Andic Cryochrepts.

The glaciated uplands are located at the highest elevations of the unit in areas of heavy snow accumulation. Dominant slopes are 30 percent to nearly vertical. These landscapes include cirque headwalls, cirque floors, and glacial troughs. Rock outcrop and talus are dominant components of these landscapes, especially in the cirques. The primary soils are deep and have very cobbly loamy sand textures in the subsoils and substrata. The surface layers are very cobbly sandy loams. They are classified as Dystric Cryochrepts. Soils with thin loamy volcanic ash surface layers are also common and are classified as Andic Cryochrepts.

Compiled By: Bitterroot NF, Ken McBride

M332Bi Frenchtown Valley

Location: This subsection is the river valley and foothills of the Clark Fork northwest of Missoula. It is in the Columbia River Basin of west central Montana.

Subsection Concept: This subsection consists of valley fill and lacustrine on toeslopes, benches and foothills of valley fill sediments of mixed origin. The major geomorphic process has been the filling and draining of glacial Lake Missoula that has modified these landscapes. The major general vegetative types include open grown coniferous forest and grasslands. The floodplains adjacent to the Clark Fork are marsh and shrublands. This map unit is separated from adjacent subsections based upon geologic structure, parent material and climatic/vegetative factors. All adjacent subsections are mountain ranges.

Subsection Setting and General Characteristics: These valley fills and lacustrine materials on toeslopes, benches and foothills have an elevation range of 3000 to 4400 feet/923 to 1354 meters. The dominant slope range is 0 to 50 percent. The dominant type of parent material is valley fill sediments from glacial Lake Missoula and recent alluvium. The primary geomorphic processes in these landscapes are fluvial and alluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the east end of the valley to 25 inches/64 cms at the western end of the unit. Most precipitation occurs in the winter and spring seasons with 40 percent of the precipitation falling as snow. The mean annual air temperature is 32 to 60 degrees F/0 to 8 degrees C.

The Clark Fork River is the main stream within the area. There are numerous small reservoirs and natural wetlands in the valley floor. The landscape is flat with rolling foothills. Wetlands occur adjacent to the Clark Fork River in alluvial deposits.

The primary natural disturbance processes are fire, disease and flooding. Human-caused disturbances include extensive urban/suburban development, some logging and agriculture activity.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is valley bottom landscapes.

The valley bottom are located on low elevation sites with dominant slope gradients from 0 to 50 percent. These landscapes include valley fill and lacustrine on toeslopes, benches and foothills of valley fill sediments of mixed origin. The major geomorphic process has been the filling and draining of glacial Lake Missoula that has modified these landscapes. The primary soils are deep with textures of loam, silt loam and clay loam. These soils are classified as Eutroboralfs and Haploxeralfs. The dominant potential natural vegetation is typically grasslands and Ponderosa pine types.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Bj Ovando Mountains

Location: This subsection is located in the Blackfoot River Basin of west central Montana.

Subsection Concept: This subsection consists of moist, Belt, block faulted mountains of argillites, quartzites and dolomites that have been modified by erosional processes. The mountainous northern portion of the subsection opens to the south onto glacial outwash plains and moraines. The major general vegetative types include coniferous forest on the mountain slopes and foothills. The plains and moraines are covered with open grow timber and grassland vegetative types. This map unit is separated from adjacent subsections based upon climatic/vegetative factors, geologic structure or parent material types. The continental divide is the eastern boundary of this subsection. To the north the subsection is colder and has much wetter habitat types. The subsections to the south and west have landforms that have much more gentle slopes with less glacial activity.

Subsection Setting and General Characteristics: These mountains, plains and moraines have an elevation range of 4000 to 9500 feet/1230 to 2923 meters). The total slope range is 0 to 100 percent but the mountain portions are, typically, 45 to 75 percent and the plains portions are, typically, 10 to 35 percent. The dominant types of rocks are argillite, quartzite and dolomite. The primary geomorphic processes in the mountain landscapes are residual faulting and fluvial. In the plains and moraines portion the processes are glacial and fluvial.

Mean annual precipitation ranges from 35 inches/89 cms to 80 inches/203 cms. This subsection receives the lower precipitation levels at the lower elevations of the plains and moraines while the mountain areas receive the higher levels of precipitation. Most precipitation occurs in the fall, winter and spring with 60 percent of the precipitation falling as snow in the mountain portions and 45 percent coming as snow in the valleys. The mean annual air temperature is 25 to 42 degrees F./-4 to 6 degrees C.

Mountain streams flow out into the valleys. The landscape is highly dissected in the mountain portion and gently rolling in the plains and moraines. Wetlands occur commonly in the moraine portion of the plain which occur in the knob and kettle area, which has been glaciated. Numerous lakes occur in the knob and kettle glaciated lands and some high elevation cirque lakes occur within the subsection.

The primary natural disturbance processes are fire, insects, disease and some mass failures. Human-caused disturbances include logging, mining and ranching on the plains and moraines.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include residual mountains and glaciated plains and moraine landscapes.

The residual mountains are located on mid to high elevation sites with dominant slope gradients of 45 to 75 percent. These landscapes include block faulted mountain and adjacent narrow valley landforms that are formed in argillite, quartzite and dolomite parent materials. The primary soils are moderately deep to deep gravelly sandy loams and loams). These soils are classified as Cryochrepts and Croborolls. The dominant potential natural vegetation is douglas fir/larch types on the wetter sites and subalpine fir/spruce types at the higher elevation sites or cold pockets.

The glaciated plains and moraines are located on low elevation sites with dominant slope gradients from 10 to 35 percent. These landscapes include plains and knob and kettle moraine landforms that are formed in glaciated outwash materials and till. The primary soils are very deep with textures of

very gravelly sandy loams and loams. These soils are classified as argiborolls and Haploborolls typify the valley bottom. The dominant potential natural vegetation is open grown timber in a grassland setting.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist.

M322Bk Alice/Nevada Mountains

Location: This subsection is located in the Clark Fork Basin of Montana.

Subsection Concept: This subsection consists of mountains of mostly metasedimentary rocks that have been modified by fluvial and colluvial processes. Included are limited areas of alpine glaciation. The major general vegetative types include coniferous forests, grasslands and shrublands. This map unit is separated from similar subsections based upon parent material, climatic and vegetative factors. Subsection M332Bj to the north is mostly alpine glaciated. M332Bg to the west is more strongly affected by maritime climatic influences, volcanic ash deposits and areas of Tertiary volcanic bedrock. M332Eff occurs within the Boulder Batholith and Elkhorns/Lowland Volcanics. M332Di is a similar adjacent subsection but occurs east of the Continental Divide.

Subsection Setting and General Characteristics: These mountains and the associated valley have an elevation range of 4000 to 8500 feet (1220 to 2593 meters). The dominant slope range in the mountainous portion is 25 to 60 percent. Slopes range from less than 5 percent in broad valley bottoms and on mountain ridgetops to greater than 60 percent on included glacial trough walls. The Avon and upper Nevada Valleys are comprised of highly dissected sedimentary terraces and fans with slopes less than 35 percent and floodplains and low stream terraces formed from recent alluvium with slopes less than 15 percent. Precambrian Belt series rocks dominate in the mountainous portion. Also included are lesser areas dominated by Paleozoic and Mesozoic limestones and other calcareous rocks in the Ophir Creek and surrounding drainages and Cretaceous and Tertiary intrusive and extrusive igneous rocks in the mountainous area south and east of Lincoln. Tertiary and Quaternary sediments dominate the Avon and upper Nevada Valley portion. Mountain slopes have developed mainly from stream dissection and colluvial action (mantle creep primarily). The stream terraces and fans in the valley have been mostly influenced by fluvial processes.

Mean annual precipitation ranges from 15 inches (38 cms) in the valley to 35 inches (88 cms) at the higher elevations. Most precipitation occurs in the spring and summer with 15 to 50 percent of the precipitation falling as snow depending on elevation. The mean annual air temperature is 32 to 42 degrees F (0 to 6 degrees C).

This mostly nonglaciated mountainous terrain is dominated by steeper gradient first and second order "v" shaped drainages in a dendritic pattern. Drainage density is moderate or high. Perennial streams often originate in seepy areas associated with colluvial basins, old landslides or lithologic breaks. Many first and second order streams are intermittent. Larger valley perennial streams in these mountains are low to moderate gradient and flow through alluvial deposits. Larger streams which originate in the higher adjacent mountainous terrain flow through the Avon and upper Nevada Valleys. Perched water tables are common in depressions and swales due to the clayey Tertiary alluvial deposits. Natural lakes do not appear to be a factor in the subsection. Wetlands in forested areas are relatively small. They are associated with seeps in basins and on toeslopes and old landslides. They also occur in lower gradient valley bottoms. Aspen groves are often associated with old landslide areas. Wetlands are more extensive in the Avon and upper Nevada Valleys. They are associated with lower gradient streams and areas of perched water table.

Ponderosa pine is very restricted in this subsection and is mostly adapted to lower elevations at or below the Forest Service boundary. Within the context of the subsection the limited glacial landforms provide some unique environments such as scree and avalanche paths. Whitebark pine occurs on high elevation ridges.

Fire is the primary natural disturbance process. Initial findings from the

Upper Blackfoot Landscape Assessment indicate that local climatic (wind and storm) patterns greatly affect fire occurrence and behavior. Larger fires can occur in late summer or fall following an earlier ignition as well as during the hot, dry portion of the summer. More frequent, less intense fires affected the valley grasslands and drier Douglas-fir habitat types. Strong winds are a major factor in this subsection at least in the northern portion of this subsection due to its proximity to the Continental Divide. Higher peak flows from flooding following larger fires can result in channel incision with sediment deposited in lower gradient mountain streams and in the Avon and upper Nevada Creek portion of the subsection. The included glaciated areas are less susceptible to stream downcutting due to the influence of larger rocks in the stream channel and banks. Rapid mass land movement is localized and is infrequent under natural conditions. It is mostly associated with old landslides and some oversteepened slopes. Under the common natural range of variation insect and disease activity was cyclic, limited in extent due to the variety of plant communities and usually at an endemic level. Currently significant areas of forest are dead or in poor health due to winter damage and severe insect and disease conditions. Much of the timber sale activity in the subsection has focused on salvage opportunities.

Human caused disturbances include livestock grazing and hay production in the Avon and Nevada Creek Valleys. They have limited the role of fire and maintained early and mid-successional grassland communities. Hay production is primarily grass with little alfalfa grown. Shrub communities have been eliminated or greatly reduced in many riparian zones. Grazing occurs on Forest Service range allotments. The most intensively managed allotments are in the southern portion of the subsection, although some valley bottoms in the northern portion have been affected by ungulate use also (such as Alice Creek). Placer mining has affected the site potential of many larger, lower gradient valley bottoms. Hard rock mining has occurred but is limited in extent. Fire suppression has lead to fuel buildup and advanced succession plant community composition and structural changes over much of the forested landscape. Timber harvest activity has occurred in many drainages. Much of the area is roaded.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include the mountains and the valley.

Forested mountains are dominated by Cryochrepts and Cryoboralfs. Udic and ustic soil moisture regimes are associated with these soils. Ustochrepts and some Eutoboralfs with frigid soil temperature regimes and ustic soil moisture regimes occur on forested high energy steeper slopes and low elevation areas.

Douglas-fir series dominates the forested areas at lower elevations and high energy slopes at intermediate elevations. Some such sites capable of supporting ponderosa pine occur at lower elevations mostly outside the Forest Service administrative boundary. Subalpine fir series is at higher elevations, on most lower energy slopes and where cold air drainage is a factor. Riparian areas in the mountainous part of the subsection are mostly influence by tree canopy (mostly subalpine fir series except for some streams on high energy aspects and at very low elevations less affected by cold air drainage where Douglas-fir series may prevail). Riparian shrub (mostly willow species) habitat types are associated with some lower gradient wider valley bottoms. Limited areas on high elevation ridges are capable of supporting whitebark pine. Argiborolls dominate the mountain grasslands and are associated with the better drained stream terraces.

Haplaquolls and Haploborolls are associated with floodplains and low terraces in the valley portion of the subsection. These soils have frigid temperature regimes and have ustic and aquatic soil moisture regimes.

Grasslands are dominated by rough fescue, big sagebrush and bluebunch wheatgrass series. Tufted hairgrass series and shrub (mostly willow species)

habitat types can occur on wet sites and in riparian areas in the Avon and upper Nevada Creek Valleys. Most grasslands within the subsection occur in the Avon and upper Nevada Valleys. They are very limited in extent on Forest Service lands in the northern and central portion of the subsection.

Compiled By: Helena National Forest. Larry Laing, principal author. Some climatic information supplied by Dave Ruppert, Deerlodge National Forest. Reviewed by Lois Olsen, Forest Ecologist

M332B1 West Fork Mountains

Location: This subsection is located in the Bitterroot River drainage of west-central Montana.

Subsection Concept: This subsection consists of precambrian mountains that were intruded by the Idaho Batholith and were also affected by volcanism. These mountains have been modified by glaciation in the southern, high elevations and by stream erosion in the low to middle elevations. Frost-churning has strongly affected high elevation ridgetops. The major general vegetative types include coniferous forest and dry grassland. This map unit is separated from similar subsections based upon the occurrence of an even mix of different rock types that occur in units too small to map separately at this scale.

Subsection Setting and General Characteristics: These mountains have an elevation range of 4500 to 8700 feet (1370 to 2650 meters). The dominant slope range is 40 to 80 percent. The dominant types of rocks are weathered granite, quartzite, rhyolite, and gneiss. The primary geomorphic processes in these landscapes are stream erosion and lesser amounts of glaciation.

Mean annual precipitation ranges from 16 inches/41 cms at the lowest elevations to 55 inches/140 cms on the high elevation ridgetops. Most precipitation occurs in the winter and spring months with 60 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 46 degrees F (-4 to 8 degrees C).

Streams typically occur on dissected mountain slopes and valleys. Bluejoint Creek and the West Fork of the Bitterroot River course through major valleys, the upper portions of which were glaciated. The landscape is moderately to highly dissected. Wetlands occur as narrow bands along the streams. Along the West Fork River and Bluejoint Creek wetlands also occur as larger units associated with beaver activity and glacial till and outwash. Alluvial basin wetlands occur in some of the highly weathered granitic and gneissic lands and in glacial cirques. Several lakes also occur in a few of the cirques.

The primary natural disturbance processes are frequent low intensity underburns on droughty slopes. On more moist slopes and valley bottoms, insect and disease plus higher biomass production cause more severe, less frequent fires that often are stand replacing. Slumps are localized disturbances in some of the volcanic rock areas. Landslides associated with faulting and stream capture occur in the upper Overwhich Creek area. Human-caused disturbances include intensive timber harvest in low to middle elevations, grazing, and significant amounts of placer mining in the Hughes Creek and Chrandal Creek the West Fork. Residential development occurs along the West Fork and lower portions of the Nez Perce Fork.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include valley bottoms and dissected mountain slopes.

The valley bottoms are located on low to middle elevation sites with dominant slopes gradients from 5 to 20 percent. These include the large valleys of the West Fork, Bluejoint Creek, and the lower portions of major streams. These landscapes include floodplains and stream terraces that formed in outwash and alluvium. The primary soils are deep and typically have a loamy surface layer underlain by very cobbly or gravelly sands and loamy sands. These valley bottom soils range from very poorly to excessively drained, depending on depth to water table. These soils are classified as Typic Cryochrepts and Typic Cryaquents. The dominant potential natural vegetation is Douglas-fir/ponderosa pine forest with areas of hydric spruce forest and willow/sedge riparian types.

The dissected mountain slopes landscapes are located on the mountain slopes and ridges with dominant slope gradients of 35 to 80 percent. The landscapes include dissected steep mountain slopes and stream breaklands comprised of colluvium and residuum. The primary soils on droughty slopes are shallow and have very cobbly sandy loam to sandy clay loam textures. On more moist slopes the soils are deep and have very cobbly or very gravelly sandy loam to sandy clay loam textures. Soils on north-facing slopes and on high ridges typically have a volcanic ash cap 4 to 8 inches thick. The shallow soils are Lithic Argiborolls and Lithic Ustochrepts. The deep soils are Typic Cryochrepts, Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryoboralfs. The dominant potential natural vegetation is dry ponderosa pine and Douglas-fir forest and dry grasslands on droughty slopes and mesic Douglas-fir, subalpine fir, and lodgepole pine on other slopes. The high elevation ridges have whitebark pine forest types.

Glacial cirques and troughs comprise a minor but ecologically significant portion of this unit at the highest elevations. Rock outcrop and talus dominate these landscapes. Soils are classified as Andic Cryochrepts and the vegetation is mainly subalpine fir, spruce, and whitebark pine.

Compiled By: Bitterroot NF; Ken McBride

M332Bm Bitterroot Valley Fans and Terraces

Location: This subsection is located in the Bitterroot Valley drainage of west-central Montana.

Subsection Concept: This subsection consists of glacial outwash fans and stream terraces that formed in coarse outwash and finer alluvium from mixed rock types. Post-pleistocene stream erosion has dissected the outwash fans and produced flat-topped terraces. The major general vegetative types include coniferous forest, grassland, wet shrublands and sedge meadows. This map unit is separated from similar subsections based upon the occurrence of unconsolidated pleistocene and post-pleistocene deposits.

Subsection Setting and General Characteristics: These fans and terraces have an elevation range of 3300 to 4100 feet (1000 to 1250 meters). The dominant slope range is 1 to 20 percent. The primary geomorphic process in these landscapes is deposition of coarse glacial outwash and post-pleistocene finer sediments by streams.

Mean annual precipitation ranges from 12 inches/31 cms to 16 inches/41 cms. Most precipitation occurs in the winter and spring months with 60 percent of the precipitation falling as snow. The mean annual air temperature is 45 to 47 degrees F (7 to 8 degrees C).

The Bitterroot River runs the length of the unit in a north/south direction. Numerous creeks originating in adjacent mountains cross the unit in an east/west direction as they drain into the Bitterroot River. The landscape is slightly to moderately dissected. Wetlands occur along the smaller creeks as narrow stringers. Extensive shrub, cattail, and sedge wetlands are associated with the floodplain of the Bitterroot River. In the Lee Metcalf National Wildlife Refuge numerous ponds have been created.

The primary natural disturbance processes are flooding along the Bitterroot River and low intensity underburns in the dry coniferous forests and grasslands. Human-caused disturbances include extensive urban/suburban development, grazing, haying, timber harvest, and sand/gravel mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include outwash fans/terraces and the main Bitterroot River floodplain terraces.

The outwash fans and terraces are located at the base of the Bitterroot Range to the west and the base of the Tertiary terraces to the east and have dominant slope gradients from 5 to 20 percent. These landscapes include glacial outwash fans that have been reshaped by post-pleistocene streams into a series of east/west oriented stream terraces and low fans. These landforms formed in coarse outwash. The primary soils are deep extremely gravelly to extremely cobbly sands and loamy sands overlain by finer-textured alluvium. These soils are classified as Typic Ustochrepts, Typic Argiborolls, and Typic Haploborolls. The dominant potential natural vegetation is dry ponderosa pine and bluebunch wheatgrass types.

The river floodplain lies immediately adjacent to the Bitterroot River and is about one mile wide throughout its length with slope gradients of 1 to 5 percent. This landscape consists of low recent floodplains associated with the active river channel and higher terraces that rarely flood but have high water tables. The primary soils are deep and very poorly to somewhat poorly drained soils that generally have coarse extremely cobbly loamy sand textures. These are classified as Oxyaquic Udifluvents and Typic Endoaquents. Old filled river channels are deep and have silt loam, fine sandy loam and loam textures as stratified layers. These soils are Typic Haplaquolls and Cumulic Endoaquolls. The dominant potential natural vegetation is uncertain but community types include moist ponderosa pine types and cottonwood, cattail,

willow, and sedge wetlands and riparian areas.

Compiled By: Bitterroot NF, Ken McBride

M332Bn Boles Point Mountains

Location: This subsection is located west of the Clearwater River and north of the Blackfoot River in west central Montana. It is part of the Columbia River Basin.

Subsection Concept: This subsection consists of moist, moderately steep belt residual mountains and rolling glacial till moraines. The residual mountains are quartzites and argillites from the precambrian Belts Formation. The glacial material is formed from varied sources of mixed origins. The residual mountains have been modified by colluvial and fluvial processes at the lower elevations and frost churning in the vicinity of the reservation divide. The foothills and plains have been developed by glacial processes that occurred with the continental glaciation of the area. The major general vegetative types is coniferous forest with a few small openings of marshland. This map unit is separated from similar subsections based upon geologic structure to the east and south. Climatic/vegetative factors are different to the north and west.

Subsection Setting and General Characteristics: This area has an elevation range of 3600 to 7200 feet/1108 to 2215 meters. The dominant slope range of the mountain portion is 35 to 75 percent. The dominant slope range of the glaciated portion is 0 to 45 percent. The dominant types of rocks are quartzites and argillites from the precambrian Belts Formation. The glacial material is formed from varied sources of mixed origins. The primary geomorphic processes in these landscapes are glacial, fluvial and colluvial.

Mean annual precipitation ranges from 35 inches/89 cms at the lower elevations to 80 inches/203 cms at the higher elevations. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 43 degrees F/-4 to 6 degrees C.

The Blackfoot River flows along the southern boundary of this area with it's associated reservoirs, wetlands and riparian. The Clearwater River flows along the eastern boundary of this area with it's associated lakes, wetlands and riparian. There are several high elevation cirque lakes. The glaciated lands have several areas of knob and kettle topography. These sites are noted for their wetland kettles. The landscape is slightly dissected.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include recreational development and activities plus logging.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include moist, moderately steep belt residual mountains and rolling glacial till moraines.

The moderately steep belt residual mountains are located on mid elevation sites with dominant slope gradients from 35 to 75 percent. These landscapes include slope and ridgetop landforms that are formed in quartzites and argillites from the precambrian Belts Formation. The primary soils are shallow to moderately deep with textures of sandy loam and loam. These soils are classified as Cryochrepts. The dominant potential natural vegetation is typically Lodgepole pine with Douglas fir/ Larch types on the wetter sites and Subalpine fir/Spruce types on the higher elevation sites.

The rolling glacial till moraines are located on low elevation sites with dominant slope gradients from 0 to 45 percent. These landscapes include knob and kettle land, moraine and outwash or till plain landforms that are formed in glacial material which is formed from varied sources of mixed origin parent materials. The primary soils are deep with textures of loam and sandy loam.

These soils are classified as Eutroboralfs and Eutrochrepts. The dominant potential natural vegetation is typically Lodgepole pine with Douglas fir/Larch types on the wetter sites and Subalpine fir/Spruce types on the higher elevation sites.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Ca Rocky Mountain Front - NE Glacier Park

Location: This subsection is located within the boundaries of Glacier National Park on the east side of the continental divide west of Babb. The St. Mary and Belly Rivers are the primary drainages associated with this area.

Subsection Concept: This subsection consists of major plates of Proterozoic sediments, modified by alpine glaciation. The major general vegetative type is coniferous forest. This subsection is unique in that its' drainage flows into the Hudson Bay. It is also differentiated from similar subsections by its' famous, still existant glaciers, and a higher occurrence of mountain lakes than similar subsections.

Subsection Setting and General Characteristics: These mountains have an elevation range of 5000 feet (1562 meters) to 10800 feet (3375 meters). The dominant slope range is 25 to 70 percent. The dominant lithology is metasedimentary and metavolcanic rock of the upper parts of the Belt supergroup. These include argillites and siltites and some quartzite and carbonate beds. The primary geomorphic processes are glacial, residual weathering, frost churning, and alluviation.

Mean annual precipitation ranges from 27 inches (69 cm.) at St. Mary to 90 inches (228 cm.) at the highest mountain peaks. Most of the precipitation occurs in the spring and winter months with approximately 50 to 70 percent falling as snow. The mean annual air temperature is 34 to 38 degrees (1 to 3 degrees C.)

Perennial and intermitent streams are common on mountain and foothill landscapes. Drainage density is high. The occurrence of mountain lakes is moderate. Small wetlands associated with springs are common. The St Mary and Belly rivers flow through this subsection.

The primary natural disturbance processes are wildfire, and flooding. Insects and disease are secondary disturbances. The primary human-caused disturbances are attributed to recreational activity. This subsection is entirely within the boundary of Glacier National Park.

Subsection Ecological Relationships:

This subsection consists of landscapes including valley bottoms, upland, and alpine landscapes.

The valley bottoms are located on low elevation sites with dominant slope gradients from 0 to 15 percent. This landscape consists of floodplain and low terrace landforms formed in deep mixed alluvial deposits of sand, silt, gravel and cobble. The soils are classified as Aquic Ustifluvents and Fluvaquent Haploborolls. The dominant potential natural vegetaion is Engleman spruce, Geyers willow series.

The uplands are located on low to mid elevation sites with dominant slope gradients of 15 to 45 percent. These landscapes include glacial moraine, high glacial outwash terraces, alluvial fans, and residual mountain slopes. The soils on these landscapes are formed in very gravelly and very cobbly loams and silt loams. These soils are classified as Typic Cryochrepts, Typic Eutroboralfs and Typic Cryoborolls. The dominant potential natural vegetation is Engleman spruce, subalpine fir series. Rough fescue grasslands, douglas fir and limber pine series forests extend into this zone on dry south and westerly lower slopes.

The alpine landscapes are located on high elevation sites, with a dominant slope gradient of 25 to 70 percent. These landscapes have glacial cirque headwalls, cirque basins, alpine ridges, scoured mountain slopes, and glacial trough wall landforms. The primary soils are very shallow to moderately deep very gravelly or very cobbly loams. These soils are classified as Lithic or

Typic Cryorthents. The potential natural vegetation is upper subalpine fir whitebark pine series. Alpine tundra occurs above 8000 feet.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group. Richard Saunders, principle author

M332Cb Rocky Mountain Front - Two Medicine

Location: This subsection is located in the Rocky Mountains on the east side of the continental divide west of Browning and Heart Butte. The Two Medicine River provides the primary drainage for this area.

Subsection Concept: This subsection consists of thrust-faulted and folded Paleozoic and Mesozoic sediments modified by alpine glaciation. The major general vegetative type is coniferous forest. This subsection is distinguished from similar subsections by the north-west trending orientation of thrust faults.

Subsection Setting and General Characteristics: These mountains and foothills have an elevation range of 5000 feet (1562 meters) to 8600 feet (2687 meters). The dominant slope range is 25 to 60 percent. The dominant lithology is Paleozoic and Mesozoic mudstones and sandstones. Limestone and dolomite are secondary components. The primary geomorphic processes are glacial, residual weathering, dry creep, and alluviation.

The mean annual precipitation of this subsection is approximately 20 inches (51 cm) on the lower foothills and up to 60 inches (152 cm) at the highest elevations of limestone reef. Most of this precipitation comes in the spring and winter months and approximately 50 to 70 percent of this comes as snow. The mean annual air temperature is from 34 to 38 degrees F (1 to 3 degrees C).

Intermittent and ephemeral streams are common on foothill landscapes. Perennial streams are usually on the lower elevation floodplains. Drainage density is high. The occurrence of ponded surface greater than 2 acres in size is rare. Small wetlands associated with springs and seeps are present especially at lower elevations in shale sediments. The Sun and Teton rivers flow through this subsection.

The primary natural disturbances are wildfire, and flooding. Insects and disease are secondary disturbances. Human-caused disturbances are mainly attributed to recreational activity. The area is heavily used by commercial outfitters and is very popular for most outdoor activities by the general public. Some oil and gas related exploration along with some limited development has occurred in the Badger-Two Medicine area. Hardrock mining and timber harvest have been very limited.

Subsection Ecological Relationships:

This subsection consists of landscape settings including valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on low elevations with dominant slope gradients of 0 to 15 percent. This landscape consists of floodplain and low terrace landforms formed in deep mixed mixed alluvial deposits of sand, silt, gravel, and cobble. The soils are classified as Aquic Ustifluvents, and Fluvaquent Haploborolls. The dominant potential natural vegetation is Engleman Spruce, Geyers willow series.

The uplands are at mid to high elevation with dominant slope gradient of 15 to 45 percent. These landscapes include glacial moraine, high glacial glacial outwash terraces, alluvial fans, and residual mountain slopes. The soils on these landscapes are formed in very gravelly and very cobbly loams and silt loams. These soils are classified as Typic Cryochrepts, Typic Cryoboralfs, and Typic Cryoborolls. The dominant potential natural vegetation is Engleman spruce, lower subalpine fir series. Rough fescue grasslands, Douglas-fir and limber pine series forests extend into this zone on dry south and westerly lower slopes.

The alpine landscapes are located on high elevation sites, with a dominant slope gradient of 25 to 70 percent. These landscapes have glacial cirque

headwalls, cirque basins, alpine ridges, scoured mountain slopes, and glacial trough wall landforms. The primary soils are very shallow to moderately deep very gravelly or very cobbly loams. These soils are classified as Lithic or Typic Cryorthents. The potential native vegetation is upper subalpine fir, whitebark pine series. Alpine tundra occurs above 8000 feet.

Compiled by: Lewis and Clark National Forest Planning and Implementation Specialists. Richard Saunders, principal author

M332Cc Rocky Mountain Front - Teton

Location: This subsection is located in the Rocky Mountains on the east side of the continental divide west of Choteau. The Teton River provides the primary drainage for this area.

Subsection Concept: This subsection consists of thrust-faulted and folded mountain slopes of Paleozoic and Mesozoic sediments, modified by alpine glaciation. The major general vegetative type is coniferous forest. The subsection is separated from similar subsections based on its' orientation of thrust faulting which tends to be north-south.

Subsection Setting and General Characteristics: These mountains have an elevation range of 5000 to 9000 feet (1562 to 2812 meters). The dominant slope range is 25 to 60 percent. The dominant lithology is Paleozoic and Mesozoic mudstones and sandstones. Limestone and dolomite are secondary components. The primary geomorphic processes are glacial, residual weathering, dry creep, and alluviation.

Mean annual precipitation ranges from 20 inches (50 cm) at the lower elevations to 60 inches (152 cm) at the highest mountain peaks. Most precipitation occurs in the spring and winter months and approximately 50 to 70 percent falling as snow. The mean annual air temperature is 34 to 38 degrees F (1 to 3 degrees C).

Perennial and intermitent streams are common on mountain and foothill landscapes. Drainage density is high. The occurrence of mountain lakes is very low. Small (less than 2 acre) wetlands are present as springs especially associated with lower elevation shale sediments. The Sun and Teton rivers run through this subsection.

The primary natural disturbance processes are wildfire, and flooding. Insects and disease are secondary disturbances. The primary human-caused disturbances are attributed to recreational activity. The area is heavily used by commercial outfitters and is very popular for most outdoor activities with the general public. Rocky Mountain Hi Ski Resort, a small one chairlift facility is located west of Chouteau in the Teton river drainage. Some oil and gas exploration along with limited development in the Blackleaf area has occurred. Hard rock mining and timber harvest has been very limited.

Subsection Ecological Relationships:

This subsection consists of landscapes including valley bottoms, upland, and alpine landscapes.

The valley bottoms are located on low elevation sites with dominant slope gradients from 0 to 15 percent. This landscape consists of floodplain and low terrace landforms formed in deep mixed alluvial deposits of sand, silt, gravel and cobble. The soils are classified as Aquic Ustifluvents and Fluvaquent Haploborolls. The dominant potential natural vegetation is Engleman spruce, Geyers willow series.

The uplands are located on low to mid elevation sites with dominant slope gradients of 15 to 45 percent. These landscapes include glacial moraine, high glacial outwash terraces, alluvial fans, and residual mountain slopes. The soils on these landscapes are formed in very gravelly and very cobbly loams and silt loams. These soils are classified as Typic Cryochrepts, Typic Cryoborolls and Typic Cryoborolls. The dominant potential natural vegetation is Englemann spruce, lower subalpine fir series. Rough fescue grasslands, douglas fir and limber pine series forests extend into this zone on dry south and westerly lower slopes.

The alpine landscapes are located on high elevation sites, with a dominant slope gradient of 25 to 70 percent. These landscapes have glacial cirque

headwalls, cirque basins, alpine ridges, scoured mountain slopes, and glacial trough wall landforms. The primary soils are very shallow to moderately deep very gravelly or very cobbly loams. These soils are classified as Lithic or Typic Cryorthents. The potential natural vegetation is upper subalpine fir whitebark pine series. Alpine tundra occurs above 8000 feet.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group.
Richard Saunders, principle author

M332Cd Slate Goat Mountain

Location: This subsection is located in the Rocky Mountains on the east side of the continental divide west of Augusta. The Sun and Dearborn rivers provide the primary drainage for this area.

Subsection Concept: This subsection consists of major plates of Precambrian and Paleozoic sedimentary sediments, modified by alpine glaciation. The major general vegetative type is coniferous forest. The subsection is separated from similar subsections based on its lithology.

Subsection Setting and General Characteristics: These mountains have an elevation range of 5400 feet (1687 meters) to 9000 feet (2812 meters). The dominant slope range is 10 to 60 percent. The dominant lithology is limestone, dolomite, and quartzite with argillite and diorite sills. The primary geomorphic processes are glacial, residual weathering, dry creep, and alluviation.

Mean annual precipitation ranges from 22 inches (63cm) in the lower elevation foothills to 60 inches (152cm) at the highest mountain peaks. Most of the precipitation occurs in the spring and winter months with approximately 50 to 70 percent falling as snow. The mean annual air temperature is 34 to 38 degrees (1 to 3 degrees C.)

Perennial and intermittent streams are common on mountain and foothill landscapes. Drainage density is high. The occurrence of mountain lakes is very low. Small (less than 2 acre) wetlands are present as springs especially associated with lower elevation shale sediments. The Sun and Dearborn rivers flow through this subsection.

The primary natural disturbance processes are wildfire, and flooding. Insects and disease are secondary disturbances. The primary human-caused disturbances are attributed to recreational activity. The area is heavily used by commercial outfitters and is very popular for most outdoor activities with the general public. Hard rock mining and timber harvest activity has been very limited.

Subsection Ecological Relationships:

This subsection consists of landscapes including valley bottoms, upland, and alpine landscapes.

The valley bottoms are located on low elevation sites with dominant slope gradients from 0 to 15 percent. This landscape consists of floodplain and low terrace landforms formed in deep mixed alluvial deposits of sand, silt, gravel and cobble. The soils are classified as Aquic Ustifluvents and Fluvaquent Haploborolls. The dominant potential natural vegetation is Engelman spruce, Geysers willow series.

The uplands are located on low to mid elevation sites with dominant slope gradients of 15 to 45 percent. These landscapes include glacial moraine, high glacial outwash terraces, alluvial fans, and residual mountain slopes. The soils on these landscapes are formed in very gravelly and very cobbly loams and silt loams. These soils are classified as Typic Cryochrepts, Typic Eutroboralfs and Typic Cryoborolls. The dominant potential natural vegetation is Englemann spruce, subalpine fir series. Rough fescue grasslands, Douglas fir and limber pine series forests extend into this zone on dry south and westerly lower slopes.

The alpine landscapes are located on high elevation sites, with a dominant slope gradient of 25 to 70 percent. These landscapes have glacial cirque headwalls, cirque basins, alpine ridges, scoured mountain slopes, and glacial trough wall landforms. The primary soils are very shallow to moderately deep very gravelly or very cobbly loams. These soils are classified as Lithic or

Typic Cryorthents. The potential natural vegetation is upper subalpine fir whitebark pine series. Alpine tundra occurs above 8000 feet.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group. Richard Saunders, principal author

M332Da Snowy Foothills

Location: This subsection is located in central Montana. It is comprised of the lowland between the Little Belt and Snowy Mountains, and the lowland to the east of the Snowies, Judith, and Moccasin Mountains. It also extends to the lowland south of The Little Belt Mountains and east of the Crazy Mountains.

Subsection Concept: This subsection consists of gently rolling sedimentary layers of sandstone and shale modified by alluviation. The major general vegetative type is grassland and shrubland. This subsection is separated from similar subsections by its' gently rolling topography and ponderosa pine habitat series.

Subsection Setting and General Characteristics: This subsection has an elevation range of 3500 feet (1093 meters) at Grassrange to 5000 (9000 meters) at Twodot. The dominant slope range is 10 to 25 percent. The dominant type of rocks are sandstone and shale. The primary geomorphic processes are residual weathering and alluviation.

The mean annual precipitation ranges from 15" (38 cm) at Twodot to 16" (41 cm) at Lewistown. Most of the precipitation occurs in the spring and winter months. Approximately 25 percent comes as snow at the lower elevations and 75 percent comes as snow at the higher elevations. The mean annual air temperature is from 35 to 39 degrees F. (2 to 4 degrees C).

The characteristic surface water features associated with this subsection include mainly intermittent and ephemeral streams. Drainage density is moderate to high. The occurrence of ponded surface water is rare. Small wetlands associated with springs and seeps are present.

The primary natural disturbances are wind and water erosion.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These are valley bottoms, and uplands.

The valley bottoms are at low elevation with slopes of 0 to 15 percent. This landscape consists of floodplains and terraces formed in mixed alluvial deposits of sand, silt, gravel, and cobble. These soils are classified as Aquic Ustifluvents and Fluvaquent Haploborolls. The dominant potential natural vegetation is bluebunch wheatgrass/western wheatgrass. Very dry, ponderosa pine and limber pine forests occupy 30 % of this landscape.

The uplands are at mid elevations with a slope gradient ranging from 10 to 45 percent. These landscapes are typically hilly. The primary soils are deep Typic Argiborolls and Haploborolls. The dominant potential natural vegetation is ponderosa pine, limber pine series.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group. Richard Saunders, principal author.

M332Db Snowy - Judith - Moccasin Mountains

Location: This subsection is located in central Montana, east of Lewistoun. It is drained by the Judith and Musselshell rivers.

Subsection Concept: This subsection consists of regionally uplifted mountainous terrain formed by anticlines and adjacent synclines in The Big and Little Snowies area. The irregular domal structure of the Judith and Moccasin mountains is associated with igneous activity. This geological structure has been modified by residual weathering, frost churning, dry creep, and alluviation. The major general vegetative type is a mosaic of dry coniferous forest and bluebunch wheatgrass grassland. This subsection is distinguished by its' island character, and ponderosa pine series habitat component..

Subsection Setting and General Characterists: These mountains have an elevation range of 3500 feet (1093 meters) at the lower elevation foothills to 8590 feet (2684 meters) on knifeblade ridge. The dominant slope range is 10 to 60 percent. The dominant type of rock in the Big Snowies is limestone flanked by sandstone and shale units. In the Judith mountains, alkalic igneous rocks which

intruded into, and uplifted, limestone sandstone and shale are prevelant. The primary geomorphic processes on these landscapes are residual weathering, dry creep, and alluviation.

Mean annual precipitation ranges from 14" (35 cm) at Lewistoun to 40" in the highlands of the Big Snowies. Most of this precipitation occurs in the spring and winter months. Approximately 25 percent comes as snow at the lower elevations and 75 percent comes as snow at the higher elevations. The mean annual air temperature is from 35 to 39 degrees F. (2 to 4 degrees C).

The characteristic surface water features associated with this subsection include mainly intermittent and ephemeral streams. Drainage density is moderate

to high. The occurence of ponded surface water is rare. Small wetlands associated with springs and seeps are present.

The primary natural disturbance process is wildfire. Dwarf mistletoe, and spruce budworm are secondary disturbances. Flood and windthrow events are occasional. Belt creek floods on a ten year occurence. Human-caused disturbances include recreational development at Showdown Ski Area, mining in the Neihart area, and logging throughout the area. Logging and other development has been limited in the north-western portion of this map-unit. This area is being considered for wilderness designation and has an experimental forest within its perimeter.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are on low elevation sites with slopes of 0 to 15 percent. This primary landscape setting consists of floodplains and terraces formed in mixed alluvial deposits of sand, silt, gravel, and cobble. These soils are classified as Aquic Ustifluvents and Fluvaquentic Haploborolls. The dominant potential natural vegetation is Engleman Spruce, Geyers willow series.

The uplands are located on low to mid elevation sites with slopes of 15 to 45 percent. This landscape consists of mountain slopes, ridges, and alluvial fans. The soils are formed in residual igneous material and colluvium. These materials are typically gravelly and very gravelly loams and clay loams. The primary soils are moderately deep and deep, clayey and clayey-skeletal Typic Cryoboralfs. The dominant potential natural vegetation is Douglas fir and subalpine fir series.

The alpine landscapes are located at high elevations on slopes of 45 to greater than 60 percent. This landscape consists of mountain slopes, ridges, and talus slopes. The mountain slopes and ridges are formed in residual igneous and metamorphosed sedimentary materials. The primary soils are very shallow and shallow loamy-skeletal Lithic and Typic Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group
Richard Saunders, principal author

M332Dc Little Belt Mountains - Judith

Location: This subsection is located in the eastern portion of the Little Belt Mountains of central Montana. It is drained by the Judith and Musselshell Rivers.

Subsection Concept: This subsection consists mainly of uplifted dome shaped limestone geology, but mountain slopes of noncalcareous sandstones and shales have limited extent in the south-central portion. This geology has been modified by frost churning, dry creep, alluviation and very limited glaciation. The major general vegetative type is coniferous forest with rough fescue grassland inclusions.

Subsection Setting and General Characteristics: This mountainous terrain has an elevation range of 4500 feet (1406 meters) in the lower elevation foothills to 9175 feet (2867 meters) at the peak of Big Baldy Mountain. The dominant slope range is 10 to 60 percent. The dominant type of rock is limestone. Shales and sandstones are of secondary occurrence. Igneous and metamorphic rock such as syenite and quartzite are exposed at high elevations.

Mean annual precipitation ranges from a low of 14 inches (36 cm) at Checkerboard to a high of 40" (101 cm) at the peak of Big Baldy Mountain. Approximately 25 percent of this precipitation comes as snow at the lower elevations and 60 percent comes as snow at the higher elevations. The annual air temperature ranges from 2 to 4 degrees F. (35 to 39 degrees C.)

The characteristic surface water features associated with this subsection include ephemeral, intermittent, and perennial, streams. Dry Wolf and Running Wolf creeks will often flow subteranean in late summer. Ponded surface water is rare, however at high elevation in the Big Baldy area, several small lakes occur in cirque basin landscapes. This subsection is moderately dissected.

The primary natural disturbance processes is wildfire. Dwarf mistletoe and spruce budworm are secondary disturbances. Flood events and windthrow occur on an occasional frequency. Human-caused disturbances include logging, mining, and recreational activity.

Subsection Ecological Relationships:

This subsection consists of valley bottoms, uplands, and alpine landscapes.

The valley bottoms are on low elevation sites with dominant slope class of 0 to 15 percent. This landscape setting consists of floodplains, and terraces that are formed in deep mixed alluvial deposits of sand, silt, gravel and cobble. These soils are classified as Aquic Ustifluvents and Fluvaquentic Haploborolls. The dominant potential natural vegetation is Engleman spruce, and Geyers willow series.

The uplands are located on low to high elevation sites with a dominant slope class of 15 to 45 percent. This landscape setting consists of mountain slopes, mountain ridges, and alluvial fans. The mountain slope soils are formed in residual limestone bedrock and colluvium. These materials are typically gravelly or very gravelly loam or clay loam. The dominant potential natural vegetation is Douglas fir and subalpine fir Engleman spruce, lower subalpine fir series. A mosaic of rough fescue grassland, and dry Douglas fir forest makes up approximately 35 percent of this unit at lower elevations. The primary associated soils are very shallow to moderately deep loamy-skeletal Lithic and Typic Ustochrepts. The dominant potential natural vegetation is Douglas Fir and Rough Fescue series. The alluvial fans are formed in alluvium from a variety of parent materials, mainly limestone. The primary soils are deep fine-loamy and loamy-skeletal Typic Haploborolls and Typic Eutroboralfs. The dominant natural vegetation is Douglas Fir and Rough Fescue series.

The alpine landscapes are located at high elevations on slopes of 45 to 60 percent. This landscape consists of mountain slopes, ridges, and talus slopes formed in residual igneous and metamorphosed sedimentary materials. The primary soils are very shallow and shallow loamy-skeletal Lithic and Typic Cryochrepts. The dominant potential natural vegetation is subalpine and whitebark pine series.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group
Richard Saunders, principal author

M332Dd Little Belt Mountains - Kings Hill

Location: This subsection is located in the western portion of the Little Belt Mountains in the Belt Creek and Smith River drainages of central Montana.

Subsection Concept: This subsection consists of uplifted mountainous terrain formed by the intrusion of Precambrian basement rock into pre existing sedimentary beds. This basic geologic structure has been modified by frost churning, dry creep, and alluviation. The major general vegetative type is coniferous forest with rough fescue grassland inclusions. This map unit is separated from the similar Judith subsection to the east based upon its' drainage into the Smith and Belt Creek drainages.

Subsection Setting and General Characterists: These mountains have an elevation range of 4800 feet (1500 meters) at Monarch to 8192 (2560 meters). The dominant slope range is 10 to 60 percent. The dominant type of rock is hard and coarse-grained. Metamorphic rock such as gneiss, schist, and quartzite is common at the core of this subsection. Limestone, sandstone, and shale prevail on the flanks. The dominant geomorphic processes are frost churn, dry creep, and alluviation.

Mean annual precipitation ranges from 13" (33 cm) at low elevation foothill sites to 42 inches (106 cm) at Spur Park near Kings Hill. Most of this precipitation occurs in the spring and winter months. Approximately 25 percent comes as snow at the lower elevations and 60 percent comes as snow at the higher elevations. The mean annual air temperature is from 35 to 39 degrees F. (2 to 4 degrees C.).

The characteristic surface water features associated with this subsection include perennial, intermittent, and ephemeral streams. Drainage density is moderate to high. The occurrence of ponded surface water is rare. Small wetlands associated with springs and seeps are present especially at lower elevations in shaley areas and areas with perched water tables caused by slowly permeable clay subhorizons.

The primary natural disturbance process is wildfire. Dwarf mistletoe, and spruce budworm are secondary disturbances. Flood and windthrow events are occasional. Belt creek floods on a ten year occurrence. Human-caused disturbances include recreational development at Showdown Ski Area, mining in the Neihart area, and logging throughout the area. Logging and other development has been limited in the north-western portion of this map-unit. This area is being considered for wilderness designation and has an experimental forest within its perimeter.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are on low elevation sites with slopes of 0 to 15 percent. This primary landscape setting consists of floodplains and terraces formed in mixed alluvial deposits of sand, silt, gravel, and cobble. These soils are classified as Aquic Ustifluvents and Fluvaquentic Haploborolls. The dominant potential natural vegetation is Engleman Spruce, Geysers willow series.

The uplands are located on low to mid elevation sites with slopes of 15 to 45 percent. This landscape consists of mountain slopes, ridges, and alluvial fans. The soils are formed in residual igneous material and colluvium. These materials are typically gravelly and very gravelly loams and clay loams. The primary soils are moderately deep and deep, clayey and clayey-skeletal Typic Cryoboralfs. The dominant potential natural vegetation is Douglas fir and subalpine fir series.

The alpine landscapes are located at high elevations on slopes of 45 to greater than 60 percent. This landscape consists of mountain slopes, ridges, and talus slopes. The mountain slopes and ridges are formed in residual igneous and metamorphosed sedimentary materials. The primary soils are very shallow and shallow loamy-skeletal Lithic and Typic Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series.

Compiled by: Lewis and Clark National Forest Planning and Implementation Group
Richard Saunders, principal author

M332De Crazy Mountains

Location: This subsection is located in the Missouri River Basin in Central Montana

Subsection Concept: This subsection consists of thinly bedded sedimentary sandstones and mudstones, uplifted and tilted by a central core of igneous intrusive rock. The central part of the range has been strongly modified by alpine glaciation. Fluvial and in place weathering processes have shaped the area surrounding this core. The major general vegetative types include mesic coniferous forest with interspersed grassland transitional zones and grasslands. This map unit is separated from similar subsections based upon bedrock lithology and vegetation.

Subsection Setting and General Characteristics: These mountains have an elevation range of 6000 to 11000 (1875 to 3437 meters). The dominant slope range is 10 to 60 percent. The dominant types of rocks are thinly bedded, dark colored sandstones and grayish mudstones. The primary geomorphological processes in these landscapes are glacial erosion and deposition, and associated fluviation, and rock weathering. Landforms are glacial cirques and headwalls, glacial troughs, outwash fans and plains, and benches and scarp slopes influenced by underlying bedrock structure.

Mean annual precipitation ranges from 15 inches (38 cm.) on southern grasslands to 60 inches (152 cm.) near the center of the mountain range. The variation in precipitation is largely due to orographic effects. Most precipitation occurs in the winter and spring with 70% of the precipitation falling as snow. The mean annual air temperature is 30 to 37 degrees F (0 to 1 degrees C).

Streams typically occur in valley bottoms, or in incised channels on gentle sideslopes. The landscape is moderately dissected. Wetlands occur almost entirely on alluvial flats near streams. Lakes are uncommon, and occur in cirque basins.

The primary natural disturbance processes are fire and flooding during high stream flow years. Human caused disturbances include extensive logging activities, roads, and suburban development. In some places soil erosion and stream stability have been effected by these activities.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include alpine highlands, structurally controlled uplands, and lowlands.

Alpine highlands make up 25% of the subsection. They are located on mid to high elevation sites, with dominant slopes ranging from 20 to 70%. These landscapes have glacial cirque, trough, and headwall landforms. Surficial materials are weathered bedrock, glacial till and glaciofluvial gravels. Primary soils are deep to shallow very gravelly sandy loams to very gravelly silt loams. These soils are classified as Typic and Dystric Cryochrepts. The dominant potential natural vegetation types are alpine turf and scattered subalpine fir in the subalpine fir series.

Structurally controlled uplands make up 60% of the subsection. They are located on mid elevation sites, with dominant slopes ranging from 10 to 40%. These landscapes have dipslope, cuesta, fault scarp slope, and bench landforms. Surficial materials are weathered bedrock, glacial till, and glaciofluvial gravels. The primary soils are deep to moderately deep gravelly silt loams. These soils are classified as Mollic Cryoboralfs. The dominant potential natural vegetation types are subalpine fir and Douglas fir series.

Lowlands make up 15% of the subsection. They are located on mid to low elevation sites, with dominant slopes ranging from 10 to 30%. These

landscapes have alluvial, glacial outwash, and structurally controlled landforms. Surficial materials are stream alluvium, glacial gravels, and weathered bedrock. The primary soils are deep gravelly silt loams and sandy loams. These soils are classified as Argic and Typic Cryoborolls and Mollic Cryoboralfs. The dominant potential natural vegetation is grassland, grassland to Douglas fir transitional areas, and Douglas fir series.

Compiled By: Gallatin N. F., H. Shovic

M332Df Adel Mountains

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of mountains and foothills of volcanic rocks that have been modified by fluvial, colluvial and residual processes. The major general vegetative types include a mosaic of grasslands and dry coniferous forests. Moderately dry forest occurs at higher elevations on low energy aspects. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains and foothills have an elevation range of 4500 to 7100 feet (1373 to 2166 meters). The dominant slope range is 10 to 60 percent. The dominant types of rocks are Cretaceous volcanic rocks (with strong component of shonkinite). The primary geomorphic processes in these landscapes are fluvial, residual and colluvial.

Mean annual precipitation ranges from 12 inches (30 cms) at the lower elevations to 20 inches (50 cms) on the higher peaks. Most precipitation occurs in the spring and summer with 15 to 30 percent of the precipitation falling as snow. The mean annual air temperature is 38 to 45 degrees F (3 to 7 degrees C).

Streams typically occur on mountains and foothills. The landscape is moderately to highly dissected. Most first and second order streams are intermittent or ephemeral. There appears to be no natural lakes and wetlands must be very small and limited in extent. The Missouri River flows through the center of the subsection.

Rock outcrops are numerous and support scree community types. Ponderosa pine is an important component. The rock type may be unusual (shonkinite).

The primary disturbance process, under the common natural range of variation, was relatively frequent, low to moderate intensity fire. It was an important process in terms of nutrient cycling and maintaining healthy, spatially diverse plant communities. Open ponderosa pine forests were maintained in many portions of the subsection.

Human caused disturbances include livestock grazing, timber harvest, fire suppression and regulation of Missouri River flows. Interstate 15 runs through the middle of the subsection adjacent to the Missouri River.

Subsection Ecological Relationships:

This subsection consists of mountains and foothills.

Lithic and Typic Haploborolls and Cryoborolls dominate the grasslands and some drier, relatively low canopy coniferous forests. They range from shallow on ridges and deeper in swales and on toeslopes. They are often loams with high cobble contents. Typic Eutroboralfs and Cryoboralfs occur at higher elevations and on northerly or easterly aspects and are forested. These soils are deep to bedrock and have stony or very stony clay loam or clay textures.

The dominant potential natural vegetation in the forested areas is mostly Douglas fir series. Warmer Douglas-fir habitat types at lower elevations often support ponderosa pine. Grasslands are mostly rough fescue series with some bluebunch wheatgrass habitat types on southerly aspects. Shrublands are limited in extent and are mostly big sagebrush series.

Compiled By: Helena National Forest. Larry Laing, principal author

M332Dg Beartooth Mountains

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of faulted and metamorphosed mountains dominated by Mississippian age carbonatic sedimentary rocks that have been modified by stream dissection. The major general vegetative types include coniferous forest, grasslands and shrublands. This map unit is separated from similar subsections based upon the strong influence of limestone and other highly calcareous rocks.

Subsection Setting and General Characteristics: These mountains have an elevation range of 3500 to 7500 feet (1068 to 2288 meters). The dominant slope range is 10 to 60 percent. The dominant types of rocks are Mississippian limestones and other carbonaceous rocks. The primary geomorphic processes in these landscapes are fluvial and colluvial.

Mean annual precipitation ranges from 10 inches (25 cms) at the lower elevations to 30 inches (75 cms) at the highest elevations. Most precipitation occurs in the spring and summer with 15 to 45 percent of the precipitation falling as snow depending on elevation. The mean annual air temperature is (38 to 44 degrees F (3 to 7 degrees C)).

Streams typically occur on mountain slopes and structural breaklands. The landscape is moderately to highly dissected. Most first and second order streams are intermittent or ephemeral. Larger lower gradient streams are perennial. Springs are important. Wetlands are associated with lower gradient higher order perennial streams and with springs.

Structural breaklands often support mountain mahogany. They also provide numerous rock outcrops and support scree community types. Ponderosa pine is an important component at the lower elevations and on some steeper south facing slopes at middle elevations. Due to the limestone bedrock present in many drainages the nutrient status of many of the streams in the subsection tend to be relatively high.

The primary disturbance process, under the common natural range of variation, was relatively frequent, low to moderate intensity fire on the grasslands and drier forests. Some less frequent stand replacing (lethal) fires typically occurred on some cooler aspects and higher elevation forest sites. Fire was an important process in terms of nutrient cycling and maintaining healthy, spatially diverse plant communities. Open ponderosa pine forests were maintained at lower elevations in portions of the subsection.

Human-caused disturbances include livestock grazing, timber harvest, roading, mining and fire exclusion.

Subsection Ecological Relationships:

This subsection consists of uplands.

Cryoborolls dominate the grasslands. Ustochrepts are associated with lower aspects and steep high energy aspects at higher elevations. Cryochrepts occur at higher elevations and on northerly or easterly aspects. These soils generally have loamy textures and high rock contents. These soils where associated with limestone have high subsurface lime contents (carbonatic mineralogy).

Forested areas are mostly Douglas fir series. Warmer Douglas-fir habitat types at lower elevations often support ponderosa pine. Subalpine fir series is limited to highest elevations and steep north aspects. Grasslands are mostly rough fescue series with some bluebunch wheatgrass habitat types on southerly aspects. Shrublands are big sagebrush series.

Compiled By: Helena National Forest. Larry Laing, principal author

M332Dh Big Belt Mountains

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of mountains dominated by Precambrian metasedimentary rocks that have been mostly modified by fluvial and colluvial (mantle creep and limited slumping) processes. Granitic intrusions occur in the vicinity of Boulder-Baldy and Mt. Baldy and have been subjected to glaciation. The major general vegetative types include coniferous forests and grasslands. This map unit is separated from similar subsections based upon geologic structure, parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These mountains have an elevation range of 4000 to 9500 feet (1220 to 2898 meters). The dominant slope range is 25 to 60 percent, but can range from less than 5 percent in broad valley bottoms and on mountain ridgetops to greater than 60 percent on included glacial trough and cirque walls and structural breaklands. The mountainous portion of this subsection is dominated by nonglaciaded mountain slopes mostly influenced by Precambrian rocks. It is associated with the Newland Limestone and Greyson Shale Formations. These formations are dominated by thinly bedded dolomite and shales, respectively. Included are limited areas of alpine glaciation often associated with granitic intrusions. The primary geomorphic processes in these landscapes are fluvial, colluvial and glacial. Residual and aeolian processes also have influenced this landscape but to a lesser degree.

Mean annual precipitation ranges from 15 inches (38 cms) at the lowest elevations to over 35 inches (88 cms) on the highest peaks. Most precipitation occurs in the spring and summer with 15 to 50 percent of the precipitation falling as snow depending on elevation. The mean annual air temperature is 33 to 42 degrees F (1 to 6 degrees C).

Nonglaciaded mountainous terrain is dominated by steeper gradient first and second order "V" shaped drainages in a dendritic pattern. Drainage density is moderate or high. Perennial streams often originate in seepy areas associated with colluvial basins, old landslides or lithologic breaks. Many first and second order streams are intermittent. Larger valley perennial streams in these mountains are low to moderate gradient and flow through alluvial deposits. In the alpine glaciaded portion of the subsection streams most often flow through glacial till and outwash deposits and support perennial flows. Natural lakes are associated with glacial cirque basins.

Wetlands are relatively small. They are associated with seeps in basins and on toeslopes, old landslides and glacial deposits. Most of these are forested. Wetlands also occur in lower gradient valley bottoms and often support willow and birch communities. Aspen are often associated with old landslide areas, some lower gradient streams and areas of perched water table.

Ponderosa pine is very restricted in this subsection and is mostly adapted to lower elevations. Within the context of the subsection the limited glacial landforms provide some unique environments such as scree and avalanche paths. As mentioned above whitebark pine occurs on high elevation ridges.

The primary disturbance process, under the common natural range of variation, was fire. More frequent, less intense fires affected the valley grasslands and drier Douglas-fir habitat types. Higher peak flows from flooding following larger fires can result in channel incision with sediment deposited in lower gradient mountain streams. The included glaciaded areas are less susceptible to stream downcutting due to the influence of larger rocks in the stream channel and banks. Rapid mass land movement is localized and is infrequent under natural conditions. It is mostly associated with old landslides and some oversteepened slopes. Under the common natural range of variation insect and

disease activity was cyclic, limited in extent due to the variety of plant communities and usually at an endemic level. Currently significant areas of forest are dead or in poor health due to winter damage and severe insect and disease conditions. Some recent timber sale activity in the subsection has focused on salvage opportunities.

Human caused disturbances include intensive livestock grazing and placer mining which has occurred since the 1870s in the Big Belts. It has limited the role of fire and maintained early and mid-successional grassland communities. Shrub communities have been eliminated or greatly reduced in many riparian zones. Placer mining has affected the site potential of many larger, lower gradient valley bottoms. Hard rock mining has occurred but is limited in extent. Fire suppression has led to fuel buildup and advanced succession plant community composition and structural changes over much of the forested landscape. Timber harvest activity has occurred in many drainages. Much of the area is roaded.

Subsection Ecological Relationships: This subsection consists of mountains with both nonglaciaded and glaciaded landscapes.

Forested areas are dominated by Typic Cryochrepts and Typic and Mollic Cryoboralfs. Limited volcanic ash influence has occurred at the highest elevations. Udic and ustic soil moisture regimes are associated with these soils. Lithic and Typic Ustochrepts and some Mollic Eutoboralfs with frigid soil temperature regimes and ustic soil moisture regimes occur on forested high energy steeper slopes and low elevation areas. The depths of these forested soils varies but are often less than 60 inches to bedrock in the nonglaciaded areas and deeper when associated with glacial deposits. Lithic and Typic Argiborolls (less than 40 inches to bedrock) dominate the mountain grasslands. They are also associated with the deeper better drained terraces of the many broader roughly east-west oriented valley bottoms within the mountain range. These soils have frigid temperature regimes and ustic soil moisture regimes. In general the upland soils have loamy textures and relatively high rock contents. Aquolls, Aquepts and Aquepts occur on the lowest stream terraces. These soils can have cryic or frigid temperature regimes and have aquic soil moisture regimes. They are very limited in extent.

The dominant potential natural vegetation in the forested areas is mostly Douglas-fir and subalpine fir series. Douglas-fir series dominates the forested areas in the unglaciaded portion of the subsection. Some such sites, mostly in the lower elevations of the northwest portion of the subsection, are capable of supporting ponderosa pine. Typically a pattern of repeating low and high energy slopes is evident but both supporting Douglas-fir habitat types. Subalpine fir series dominates the glaciaded areas of the subsection which tend to be relatively high elevation and strongly influenced by cold air drainage. Riparian areas in the mountainous part of the subsection are mostly influenced by tree canopy (mostly subalpine fir series except for some streams on high energy aspects and at very low elevations less affected by cold air drainage where Douglas-fir series may prevail). Riparian shrub (mostly willow species) habitat types are associated with some lower gradient wider valley bottoms. Limited areas on high elevation ridges are capable of supporting whitebark pine. Grasslands are dominated by rough fescue and bluebunch wheatgrass series. Shrublands are dominated by big sagebrush series with a limited amount of antelope bitterbrush series.

Compiled By: Helena National Forest. Larry Laing, principal author.
Potential vegetation section reviewed by Lois Olsen, Forest Ecologist.

M332Di Granite Butte

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of mountains and foothills of mostly metasedimentary rocks that have been modified by fluvial and colluvial processes. Included are limited areas of alpine glaciation. The major general vegetative types include coniferous forests, grasslands and shrublands. This map unit is separated from similar and adjacent subsections based upon parent material, climatic and vegetative factors. M332Bk is similar but is located west of the Continental Divide and includes substantial valley landforms. M332Dj occurs within the Boulder Batholith and Elkhorns/Lowland Volcanics. M332Dk occurs in a valley setting and is dominated by grasslands and shrublands. M332Dk is strongly influenced by carbonaceous bedrock.

Subsection Setting and General Characteristics: These mountains and foothills have an elevation range of 4500 to 8500 feet (1373 to 2593 meters). The dominant slope range is 25 to 60 percent. Slopes range from less than 5 percent in some lower valley bottoms and on ridgetops to greater than 60 percent on included glacial trough walls. Precambrian Belt series rocks dominate. Also included are small areas dominated by Paleozoic and Mesozoic limestones and other calcareous rocks in portions of the Austin and Greenhorn Creek drainages and Cretaceous and Tertiary intrusive and extrusive igneous rocks south and east of Lincoln. Mountain slopes have developed mainly from stream dissection and colluvial action (mantle creep primarily).

Mean annual precipitation ranges from 15 inches (38 cms) in the lower foothills to 35 inches (88 cms) at the higher elevations. Most precipitation occurs in the spring and summer with 15 to 50 percent of the precipitation falling as snow depending on elevation. The mean annual air temperature is 32 to 42 degrees F (0 to 6 degrees C).

This mostly nonglaciated mountainous terrain is dominated by steeper gradient first and second order "V" shaped drainages in a dendritic pattern. Drainage density is moderate or high. Perennial streams often originate in seepy areas associated with colluvial deposits in basins and toeslopes, old landslides or lithologic breaks. Many first and second order streams support intermittent flows. Larger valley perennial streams are low to moderate gradient and flow through alluvial deposits. Wetlands in forested areas are relatively small. They are associated with seeps in basins and on toeslopes and old landslides. They also occur in lower gradient valley bottoms. Aspen groves can be associated with these wet areas.

Ponderosa pine is mostly adapted to lower elevations at or below the Forest Service boundary. Within the context of the subsection the limited glacial landforms provide some unique environments such as scree and avalanche paths. Whitebark pine occurs on high elevation ridges.

Fire is the primary natural disturbance process. Local climatic (wind and storm) patterns affect fire occurrence and behavior. Larger fires can occur in late summer or fall following an earlier ignition as well as during the hot, dry portion of the summer. More frequent, less intense (short duration) fires affected the grasslands and drier Douglas-fir habitat types. Strong winds are a factor in this subsection due to its association with the Continental Divide. Higher peak flows from flooding following larger fires can result in channel incision with sediment deposited in lower gradient mountain streams. The included glaciated areas are less susceptible to stream downcutting due to the influence of larger rocks in the stream channel and banks. Rapid mass land movement is localized and is infrequent under natural conditions. It is mostly associated with old landslides and some oversteepened slopes. Under the common natural range of variation insect and disease activity was cyclic, limited in extent due to the variety of plant communities and usually at an endemic level. Currently significant areas of

forest are dead or in poor health due to winter damage and severe insect and disease conditions. Some of the timber sale activity in the subsection has focused on salvage opportunities.

Human caused disturbances include livestock grazing and timber harvest. Livestock grazing has limited the role of fire and maintained early and mid-successional grassland and shrubland communities in many places. Shrub communities have been eliminated or greatly reduced in terms of diversity of structure and composition in some riparian zones. Grazing occurs on Forest Service range allotments. Placer mining has affected the site potential of many larger, lower gradient valley bottoms. Hard rock mining has occurred but is limited in extent. Fire suppression has led to fuel buildup and advanced succession plant community composition and structural changes over much of the forested landscape. Timber harvest activity has occurred in many drainages. Much of the area is roaded.

Subsection Ecological Relationships:

This subsection consists of mountains and foothills.

Forested mountains are dominated by Cryochrepts and Cryoboralfs. Udic and ustic soil moisture regimes are associated with these soils. Ustochrepts and some Eutoboralfs with frigid soil temperature regimes and ustic soil moisture regimes occur on forested high energy steeper slopes and low elevation foothills. These loamy soils are mostly deeper than 20 inches to bedrock and have high rock contents especially in the subsurface layers.

Douglas-fir series dominates the forested areas at lower elevations and high energy slopes at intermediate elevations. Some such sites capable of supporting ponderosa pine occur at lower elevations mostly outside the Forest Service administrative boundary. Subalpine fir series is at higher elevations, on most lower energy slopes and where cold air drainage is a factor. Riparian areas in the mountainous part of the subsection are mostly influenced by tree canopy (mostly subalpine fir series except for some streams on high energy aspects and at very low elevations less affected by cold air drainage where Douglas-fir series may prevail). Riparian shrub (mostly willow species) habitat types are associated with some lower gradient wider valley bottoms. Limited areas on high elevation ridges are capable of supporting whitebark pine.

Argiborolls and Cryoborolls dominate the mountain grasslands. They are loamy textured, have high subsurface rock contents and are generally less than 40 inches deep to bedrock. Deeper Borolls are also associated with some better drained stream terraces. Grasslands are dominated by rough fescue and bluebunch wheatgrass series. Shrublands are dominated by big sagebrush series.

Compiled By: Helena National Forest. Larry Laing, principal author. Some climatic information supplied by Dave Ruppert, Deerlodge National Forest.

M332Dj Boulder and Elkhorn Mountains

Location: This subsection is located in the upper Missouri River Basin of southwestern Montana.

Subsection Concept: This subsection consists of mountains of granitic and volcanic bedrock that have been modified by glaciation and stream erosion. The major vegetative types include coniferous forests, shrublands, and grasslands. This map unit is separated from similar subsections based upon the presence of igneous rocks as the only bedrock type.

Subsection Setting and General Characteristics: These granitic and volcanic mountains have an elevation range of 4500 to 9400 feet (1370 to 2860 meters). The dominant slope range is 10 to 70 percent. The dominant types of rocks are Boulder Batholith Granitics and Tertiary and Cretaceous volcanics. The primary geomorphic processes are glacial and fluvial.

Mean annual precipitation ranges from 13 inches (33 centimeters) in the foothills to 30 inches (76 centimeters) on the mountain peaks. Most precipitation occurs in the spring and summer in the foothills with 10 to 20 percent falling as snow; most precipitation occurs in the winter and spring in the mountains with 50 percent falling as snow. The mean annual air temperature is 34 to 42 degrees F (1 to 5 degrees C).

The landscape is highly dissected by streams. Wetlands are common in the glaciated portion of the subsection, along structural features, and near granitic/volcanic bedrock contacts. There are a few lakes in the glaciated portion of the subsection.

The primary natural disturbance processes are fire, insects, disease, and flooding. Human-caused disturbances include mining, logging, grazing, roads, reservoirs, and urban/suburban development.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. They are the fluvial uplands and the glaciated uplands and valleys.

The fluvial uplands are located on low and mid elevation sites with dominant slope gradients from 10 to 40 percent. The landscape includes stream dissected mountain slopes that are formed in granitic and volcanic bedrock. The primary soils are shallow and moderately deep, cobbly and gravelly, sandy loams and loams. They are classified as Typic and Lithic Cryochrepts, Cryoboralfs, Argiborolls, and Haploborolls. The dominant natural vegetation is subalpine fir, Douglas fir, sagebrush, and rough fescue habitat type series.

The glaciated uplands and valleys are located on mid and high elevation sites with slope gradients from 10 to 70 percent, almost exclusively in the northern part of the subsection. The landscape includes glacially eroded, low relief ridges and moderate relief glacial troughs. Glacial deposits mantle trough bottoms, ridges, and slopes at mid elevations. Bedrock in this landscape is granitic and volcanic. The primary soils are shallow to deep gravelly and cobbly loams and sandy loams. They are classified as Typic and Lithic Cryochrepts and Cryoboralfs. The dominant potential natural vegetation is subalpine fir and Douglas fir habitat type series.

Compiled by: Deerlodge National Forest, Dave Ruppert.

M332Dk Helena/Townsend/Boulder Valleys

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of lower elevation alluvial terraces and fans that have been modified by fluvial processes. The major general vegetative types include grasslands and shrublands. This map unit is separated from similar subsections based upon climatic and vegetative factors.

Subsection Setting and General Characteristics: These alluvial valleys have an elevation range of 3750 to 5750 feet (1144 to 1754 meters) but are mostly below 5000 feet (1525 meters). The dominant slope range is 0 to 35 percent. The dominant parent materials are Tertiary sediments and Quaternary alluvial deposits. The primary geomorphic process in these landscapes is fluvial.

Mean annual precipitation ranges from 10 inches (25 cms) at the lowest elevations to 15 inches (38 cms) on the highest terraces and fans. It ranges from 15 to 20 inches in the portion of the subsection near Bozeman. Most precipitation occurs in the spring and summer with 15 to 30 percent of the precipitation falling as snow. The mean annual air temperature is 39 to 45 degrees F (4 to 7 degrees C).

Lower gradient streams and rivers typically are associated with low stream terraces. The larger streams and rivers flow through this subsection from higher elevation adjacent subsections. The headwaters of the Missouri are in the southern part of the subsection. Floodplains tend to have high water tables. Cottonwood community types occur near large streams and rivers and wetlands (willow, wet grass and sedge habitat types) near streams and poorly drained areas. Many streams are perennial and are in a dendritic pattern. Drainage density is relatively low. Reservoirs regulate flows on the Missouri River.

Drier grasslands often equate to short grass prairie habitat.

The primary natural disturbance process, under the common natural range of variation, was frequent low intensity fires in the grasslands. They helped recycle nutrients and affected plant community distribution, structure and diversity. Also large ungulates, such as buffalo and elk, utilized these valleys. Riparian areas were more extensive and the positive influence of periodic flooding was evident prior to construction of the dams on the Missouri.

Human-caused disturbances include livestock grazing, crop cultivation, irrigation, stream diversions, fire exclusion, regulation of water flows and hydroelectric development on the Missouri River, placer mining and introduction of non-native plant and animal species and urban/suburban development (Bozeman, Townsend, Boulder, and a portion of Helena occur within the subsection).

Subsection Ecological Relationships:

This subsection consists of valley terraces and fans.

Calciorthiss, Torriorthents and Argiborolls dominate fans, benches and terraces. Argiborolls, Haplargids and Torriorthents are associated with included foothills. These soils have aridic soil moisture regimes and frigid soil temperature regimes. Included on floodplains are Fluvaquents with aquic soil moisture regimes. In the Gallatin Valley Argiborolls and Haploborolls dominate fans, benches and terraces. They have an ustic soil moisture regime and a frigid soil temperature regime. These soils are generally very deep and loamy with varying amounts of rounded rock fragments within the soil profile. Fluvaquents are associated with floodplains and have aquic soil moisture regimes.

The dominant potential natural vegetation in the mid to low elevations of the subsection are bluebunch wheatgrass, needle-and-thread grass and blue grama series. Rough fescue series occurs on some of the higher fans and foothills, primarily north of 46 degrees latitude. Idaho fescue habitat types occur in the Gallatin Valley but are less extensive elsewhere. Areas of big sagebrush, black sagebrush, limber pine and black greasewood series are included. Riparian areas often support willow, wet grass and sedge habitat types. Small areas of aspen habitat types also occur where the water table fluctuates. Floodplains of the larger rivers and streams often support cottonwood community types.

Compiled By: Helena National Forest. Larry Laing, principal author. Shelly Douthett, Range Program Manager, Townsend Ranger District and Lois Olsen, Forest Ecologist, provided information regarding potential vegetation.

M332D1 White Sulphur Springs Valley

Location: This subsection is located in the Missouri River Basin of Montana.

Subsection Concept: This subsection consists of alluvial terraces and fans that have been modified by fluvial processes. The major general vegetative types include grasslands. Some ponderosa pine and limber pine dominated communities are associated with the limited forested areas. This map unit is separated from similar subsections based upon parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: This valley has an elevation range of 4750 to 6500 feet (1449 to 1983 meters) but most of the subsection is less than 5500 feet (1525 meters). The dominant slopes are 0 to 35 percent. The dominant parent materials are Tertiary sediments and Quaternary alluvium. The primary geomorphic process in this landscape is fluvial.

Mean annual precipitation ranges from 10 inches (25 cms) at the lowest elevations to 20 inches (50 cms) on the higher terraces and fans. Most precipitation occurs in the spring and summer with 15 to 30 percent of the precipitation falling as snow. The mean annual air temperature is 38 to 44 degrees F (3 to 7 degrees C).

Streams flow through this subsection from higher elevation adjacent subsections. Streams have downcut and formed new terraces. Immediate stream terraces tend to have high water tables. They are mostly perennial and are in a dendritic pattern. Drainage density is relatively low. This subsection has substantial riparian areas and springs. Included within these areas are wetlands.

The primary natural disturbance process, under the common natural range of variation, was somewhat frequent low to moderate intensity fires which occurred in the grasslands and the drier forests. They helped recycle nutrients and affected plant community distribution, structure and diversity. Stream flows may have lasted longer and been more consistent prior to intensive livestock grazing in the area. This would be due to generally healthier and more functional riparian areas and springs.

Human-caused disturbances include livestock grazing, cultivation, irrigation, roading, placer mining and fire exclusion. Upland and riparian plant communities have been influenced by intensive livestock grazing and crop production (primarily hay). Spring developments and stream diversions are common. The area is well roaded and includes the town of White Sulphur Springs.

Subsection Ecological Relationships:

This subsection consists of an intermountain valley composed of alluvial terraces and fans.

This subsection is mostly grasslands dominated by Argiborolls and Haploborolls with ustic soil moisture regimes and frigid soil temperature regimes. They are associated with foothills, fans and terraces. Also included within the area are Cryoborolls on higher elevation foothills. They have ustic soil moisture regimes and cryic soil temperature regimes. Haplaquolls associated with low stream terraces and wetlands (aquic soil moisture regime and frigid soil temperature regime). Camborthids may occur on lower elevation fans and terraces. These soils have aridic soil moisture regimes and frigid soil temperature regimes. They are very deep, mostly loamy soils often with somewhat rounded gravels and cobbles.

Bluebunch wheatgrass and rough fescue series dominate. Big sagebrush habitat types can occur (mostly south of White Sulphur Springs). Also included are dry grasslands (such as needle-and-thread series) at the lowest elevations.

Minor forested areas occur within the subsection. These are primarily limber pine and drier Douglas-fir habitat types associated with steep rocky slopes and north aspects. Willow, tufted hairgrass and sedge habitat types dominate the riparian areas. Aspen series can occur on slightly better drained terraces and in seepy areas.

Compiled By: Helena National Forest. Larry Laing, principal author. Shelly Douthett, Range Program Manager, Townsend Ranger District provided information regarding potential vegetation. Input was also provided by Lois Olsen, Forest Ecologist.

M332Dm South Elkhorn Mountains

Location: This subsection is located in the upper Missouri River Basin of Montana.

Subsection Concept: This subsection consists of a variety of landforms and rock types that have been modified mostly by fluvial and colluvial processes. Much of the area is associated with an anticline comprised of rocks ranging in age from Cretaceous to Precambrian. Rock types can include limestone, dolomite, argillite, andesite, sandstone and quartzite. A small area of granitic rock is included. The fans, benches and terraces are associated with Tertiary sediments and Quaternary alluvial deposits. The southern portion of the subsection is dominated by relatively dry grasslands. The northern half is a mosaic of grasslands and forests. This map unit is separated from similar subsections based upon geologic structure, parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These uplands have an elevation range of 4500 to 7500 feet (1373 to 2288 meters). The dominant slope range is 0 to 60 percent. This subsection is comprised of mostly of foothills, mountains and structural complexes with some fans, benches and terraces. Although it is influenced by structurally complex and highly varied sedimentary, as well as metamorphic and volcanic rock types much of the area has been affected by limestone and other carbonatic rocks. The primary geomorphic processes in these landscapes are fluvial and colluvial. Residual and aeolian processes also had some influence.

Mean annual precipitation ranges from 12 inches (30 cms) at lower elevations to 22 inches (55 cms) at higher elevations in the northern part of the subsection. Most precipitation occurs in the spring and summer with 15 to 30 percent of the precipitation falling as snow. The mean annual air temperature is 37 to 43 degrees F (3 to 6 degrees C).

Due to the limestone and the relatively dry precipitation regime which influences much of the subsection first and second order streams support mostly ephemeral and intermittent flows. Perennial streams within the northern portion of the subsection often originate in other subsections at higher elevations. Springs are important surface water sources although they are very limited. Wetlands (willow, wet grass, sedge and/or aspen habitat types) occur near some streams and springs and can be highly productive due to limestone influence. No lakes occur within the subsection.

Drier grasslands often equate to short grass prairie habitat. The subsection is characterized by unusual geologic features associated with structural complexes (Devil's Fence, for example).

The primary disturbance process, under the common natural range of variation, was somewhat frequent low to moderate intensity fires which occurred in the grasslands and the drier forests. They helped recycle nutrients and affected plant community distribution, structure and diversity. Stream flow may have lasted longer and been more consistent prior to intensive livestock grazing in the area. This would be due to healthier and more functional riparian areas and springs.

Human caused disturbances include livestock grazing, timber harvest, mining, spring developments, cultivation, irrigation, fire exclusion and extensive roading.

Subsection Ecological Relationships:

This subsection consists of uplands which include a variety of landforms.

Calciorthids and Torriorthents dominate fans, benches and terraces.

Calciorthids and Argiborolls occur on foothills. These soils have aridic soil moisture regimes and frigid soil temperature regimes. Cryoborolls are associated with volcanic foothills (often rolling uplands). They have ustic soil moisture regimes and cryic soil temperature regimes. The mountainous portion includes Cryoborolls associated with grasslands and Cryochrepts primarily in forested areas. Carbonatic mineralogy is common. The soil moisture regimes are ustic or udic and the soil temperature regimes are frigid or cryic. Included on floodplains are Aquepts, Aquolls and Aquepts with aquic soil moisture regimes.

Bluebunch wheatgrass, needle-and-thread grass and blue grama series typify the low elevations of the subsection. Rough fescue series occurs at the mid to high elevations. Idaho fescue habitat types are also included but limited in extent. Areas of big sagebrush and black sagebrush series are included. Forested areas include limber pine and Douglas-fir series with some inclusions of subalpine fir habitat types on steep north aspects. Riparian areas often support willow, wet grass and sedge habitat types. Some steeper gradient Douglas-fir riparian habitat types also occur. Small areas of aspen habitat types also occur where the water table fluctuates.

Compiled By: Helena National Forest. Larry Laing, principal author. Shelly Douthett, Range Program Manager, Townsend Ranger District provided information regarding potential vegetation.

M332Dn London Hills/North Tobacco Root Mountains

Location: This subsection is located in the Jefferson River Basin of southwestern Montana.

Subsection Concept: This subsection consists of complexly folded and faulted uplands of volcanic, gneiss, and a variety of sedimentary and metasedimentary bedrock that have been modified by stream erosion. The major vegetative types include coniferous forests, shrublands, and grasslands. This map unit is separated from similar subsections based upon the complex structural and bedrock geology.

Subsection Setting and General Characteristics: This folded and faulted upland has an elevation range from 4200 to 8000 feet (1280 to 2440 meters). The dominant slope range is 20 to 70 percent. The rocks are a mixture of gneiss, volcanic, sedimentary, and metasedimentary bedrock. The primary geomorphic process in this landscape is stream erosion.

Mean annual precipitation ranges from 10 inches (25 centimeters) at the low elevations to 25 inches (64 centimeters) in the northern Tobacco Root Mountains. Most precipitation occurs in the spring and summer with 10 to 35 percent falling as snow. The mean annual air temperature varies from 34 to 46 degrees F (1 to 8 degrees C).

The South Boulder River and the Jefferson River originate outside of the subsections and have cut canyons into the bedrock across major structural features. The overall landscape is highly dissected by intermittent streams. Wetlands occur adjacent to the rivers and the few perennial streams in the subsection and are a minor component of the subsection. No lakes occur in the subsection.

The primary natural disturbances are fire, floods, and insects. Human caused disturbances are logging, roads, grazing, and haying.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. They are the foothills and the Northern Tobacco Root Mountains.

The foothills are located on low and mid elevation sites with dominant slope gradients from 20 to 70 percent. This landscape includes stream dissected slopes that are formed in gneiss, volcanic, and a variety of sedimentary and metasedimentary rocks. The primary soils are shallow and moderately deep, cobbly, loams and sandy loams. They are classified as Typic and Lithic Ustochrepts, Argiborolls, Haploborolls, and Camborthids. The dominant potential natural vegetation is Douglas fir, limber pine, mountain mahogany, and bluebunch wheatgrass habitat type series.

The mountains are located on mid and high elevation sites with dominant slope gradients from 35 to 70 percent. This landscape includes stream dissected slopes that are formed in a variety of sedimentary and metasedimentary rocks. The primary soils are shallow and moderately deep, channery, loams and sandy loams. They are classified as Typic and Lithic Cryoboralfs, Cryochrepts, Cryoborolls and Argic Cryoborolls. The dominant potential natural vegetation is subalpine fir, Douglas fir, sagebrush, and Idaho fescue habitat types.

Compiled by: Deerlodge National Forest, Dave Ruppert

M332Do Norris Hills

Location: This subsection is located in the Missouri River basin of southwestern Montana.

Subsection Concept: This subsection consists of low hills and pediments of gneiss that have been modified by stream dissection. The major vegetative types include shrublands and grasslands. This map unit is separated from similar subsections based upon the predominance of gneiss bedrock.

Subsection Setting and General Characteristics: These hills and pediments have an elevation range of 4500 to 5800 feet (1370 to 1770 meters). The dominant slope range is 15 to 35 percent. The dominant bedrock is gneiss. The primary geomorphic process in this landscape is stream dissection.

Mean annual precipitation ranges from 10 to 16 inches as a function of elevation. Most precipitation occurs in the spring and summer with 10 percent falling as snow. The mean annual air temperature is 43 to 47 degrees F (6 to 8 degrees C).

The landscape is moderately and highly dissected by streams, mostly intermittent.

The Madison river, which originates outside of the subsection, flows through it. Wetlands occur along stream courses and are a minor component of the subsection. There are no lakes.

The primary natural disturbance is fire. Human-caused disturbance includes grazing, haying, roads, and urban/suburban development.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the low hills and pediments.

The hills and pediments are located on low elevation sites with dominant slope gradients from 10 to 35 percent. They are formed in gneiss bedrock. The primary soils are shallow and moderately deep gravelly and cobbly loams and sandy loams. They are classified as Typic and Lithic Haploborolls, Argiborolls, and Camborthids. The dominant potential natural vegetation is sagebrush and bluebunch wheatgrass habitat type series.

Compiled by: Deerlodge National Forest, Dave Ruppert.

M332Dq Horseshoe Hills

Location: This subsection is located between the Shields River and Missouri River Basins, which are part of the Columbia River Basin in central Montana.

Subsection Concept: This subsection consists of low folded mountains and foothills of semi-dry, mixed materials formed from sandstones, shales, limestones, carbonaceous shales, calcareous shales and sandstones that have been modified by colluvial and fluvial geomorphic processes. The major general vegetative types include grass and shrublands with coniferous timber in the draws and at the high elevations. This map unit is separated from adjacent subsections based upon geologic structure, parent material or climatic/vegetative factors. This subsection is surrounded by other units on the west and east that are typically basins. To the North the subsection is generally made up of argillites and dolomitic limestones. To the south the unit is made up of granitics and mixed sedimentaries.

Subsection Setting and General Characteristics: These folded mountains and foothills have an elevation range of 5000 to 7600 feet/1538 to 2338 meters. The dominant slope range is 35 to 85 percent. The dominant types of rocks are sandstones, shales, limestones, carbonaceous shales, calcareous shales and sandstones but also includes quartzite. The primary geomorphic processes in these landscapes are colluvial, fluvial and residual.

Mean annual precipitation ranges from 25 inches/64 cms in the lowest foothills to 60 inches/152 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 65 degrees F/-6 to 18 degrees C.

Streams typically occur in narrow draws and canyons. The landscape is moderately dissected. There are numerous small tributaries, a few reservoirs and natural wetlands in the drainageways.

The primary natural disturbance processes are fire, disease and insect. Human-caused disturbances include some minor logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings which include folded mountains and foothills.

The folded mountains are located on mid elevation sites with dominant slope gradients from 50 to 85 percent. These landscapes include slope, ridgetop and narrow draw landforms that are formed in sandstones, shales, limestones, carbonaceous shales, calcareous shales and sandstones but also includes quartzite parent materials. The primary soils are shallow to moderately deep with textures of silt loam or clay loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoboralfs and Cryochrepts. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and at the higher elevations. These timber types are typically, lodgepole and limber pine plus douglas fir in the wetter sites.

The foothills are located on low elevation sites with dominant slope gradients from 35 to 55 percent. These landscapes include draw and canyon plus ridgetop and slope landforms that are formed in sandstones, shales, limestones, carbonaceous shales, calcareous shales and sandstones but also includes quartzite parent materials. The primary soils are moderately deep to deep with silt loam and clay loam textures. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoboralfs and Cryochrepts. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and canyons. These timber types are typically, lodgepole and limber pine plus Douglas-fir in the wetter sites.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Dr Bridger Mountains

Location: This subsection is located on the east side of the Gallatin Valley, north of Bozeman in the Missouri River Basin of central Montana.

Subsection Concept: This subsection consists of moist, steep dissected mountains formed in the North Boulder group, Pre-Belt gneiss, schist, and related rocks. This area is dominated by high elevation mountains that have been modified by colluvial, fluvial and faulting geomorphic processes. The major general vegetative types include coniferous forest with grass and shrublands occurring on high energy sites due to the moisture stress. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. This subsection is bordered to the west and south by units that are typically basins. To the North the subsection is generally made up of sandstones, shales and limestones. To the east the unit is made up of water-laid volcanic material, mainly andesitic.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 5000 to 8600 feet/1538 to 2646 meters. The dominant slope range is 35 to 100 percent. The dominant types of rocks are greenish-gray coarse conglomerate at base with arkose, conglomerate, plus sandy and silty strata above, additionally, rocks older than the Belt series consisting of interlaminated gneiss, schist, marble, quartzite plus gneiss and schist of both sedimentary and igneous origin. The primary geomorphic processes in these landscapes are colluvial, fluvial and faulting.

Mean annual precipitation ranges from 40 inches/102 cms at the lowest elevations to 80 inches/203 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 65 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 65 degrees F/-7 to 18 degrees C.

Streams typically occur in narrow canyons. The landscape is highly dissected. This mountain range drains west into the Gallatin River. There are numerous small tributaries, a few reservoirs and natural wetlands and floodplains in the drainageways.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include recreational development, logging, mining and some grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is a moist, steep, dissected mountain range.

The moist, steep, dissected mountain range is located on mid to high elevation sites with dominant slope gradients from 35 to 100 percent. These landscapes include mountain slope, ridgetop and narrow valley landforms that are formed in greenish-gray coarse conglomerate at base with arkose, conglomerate, plus sandy and silty strata above, additionally, rocks older than the Belt series consisting of interlaminated gneiss, schist, marble, quartzite plus gneiss and schist of both sedimentary and igneous origin. The primary soils are shallow to moderately deep with textures of clay loam and silt loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoboralfs and Cryochrepts with a significant amount of rock outcrop and talas. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and at the higher elevations. These timber types are typically, lodgepole and limber pine plus douglas fir in the wetter locations.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Ds Battle Ridge

Location: This subsection is located on the west side of the Shields River in the Missouri River Basin in the central part of Montana.

Subsection Concept: This subsection consists of semi-dry, moderately sloping to steep non-dissected mountains and foothills of Livingston formation bedrock that have been modified by colluvial and fluvial processes. The major process being the water action to rework existing material. The major general vegetative types include grass and shrublands with coniferous timber in the draws and wetter sites. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. This subsection is bordered to the east and south by units that are typically basins. To the North the subsection is generally made up of sandstones, shales and limestones. To the west the unit is made up of coarse conglomerates and Pre-Belt gneiss, schist and related rocks.

Subsection Setting and General Characteristics: These semi-dry, moderately sloping to steep non-dissected mountains and foothills have an elevation range of 5500 to 9000 feet/1692 to 2769 meters. The dominant slope range is 35 to 80 percent. The dominant types of rocks are water-laid volcanic material, mainly andesitic in composition and including agglomerate, conglomerate, sandstone and shale. The primary geomorphic processes in these landscapes are colluvial and fluvial.

Mean annual precipitation ranges from 25 inches/64 cms on the eastern edge of the subsection to 55 inches/140 cms at the higher peaks. Most precipitation occurs in the winter and spring seasons with 55 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 55 degrees F/-6 to 13 degrees C.

This subsection drains into the Shields River. There are numerous small tributaries, a few reservoirs and natural wetlands and floodplains in the drainageways. Streams occur in narrow draw or canyon topographic settings. The landscape is slightly dissected.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include logging, mining and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include moderately sloping to steep non-dissected mountains and foothills.

The moderately sloping foothills are located on low elevation sites with dominant slope gradients from 35 to 55 percent. These landscapes include rolling ridge, slope and narrow draw landforms that are formed in water-laid volcanic material, mainly andesitic in composition and including agglomerate, conglomerate, sandstone and shale parent materials. The primary soils are deep with textures of silt loam and clay loam. These soils are classified as Argiborolls and Haploborolls with a significant amount of rock outcrop and talas. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and wetter areas. These timber types are typically, lodgepole and limber pine plus douglas fir.

The steep non-dissected mountains are located on mid to high elevation sites with dominant slope gradients from 45 to 80 percent. These landscapes include ridgetop, slope and narrow canyon landforms that are formed in water-laid volcanic material, mainly andesitic in composition and including agglomerate, conglomerate, sandstone and shale parent material. The primary soils are shallow to moderately deep with textures of silt loam, clay loam and silty clay loam. These soils are classified as Cryoborolls, Lithic Cryoborolls, Cryoborolls and Cryochrepts with a significant amount of rock outcrop and talas. The dominant potential natural vegetation is timber in the draws and at

the higher elevations. Grass and brushland types are common on high energy sites due to moisture stress. The timber types are typically, lodgepole and limber pine plus douglas fir in the wetter locations.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Dt Shields River Valley

Location: This subsection is located in the Missouri River Basin of central Montana.

Subsection Concept: This subsection consists of floodplains, toeslopes, benches and foothills of water-laid volcanic materials that have been modified by fluvial geomorphic process. The major general vegetative types include grass and shrublands with hardwood timber in draws and on floodplains. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. This area is dominated by the Shields River, which runs the length of this unit. This subsection is surrounded by subsections on the west, south and east that are typically mountain ranges. To the North the subsection is made up of Tertiary sedimentary rocks, undifferentiated.

Subsection Setting and General Characteristics: These floodplains, toeslopes, benches and foothills have an elevation range of 4400 to 6800 feet/1354 to 2092 meters. The dominant slope range is 0 to 50 percent. The dominant types of rocks are andesitic in composition, but includes aplomerate, conglomerate, sandstone and shale. The valley fill material is generally, water-laid and unconsolidated. The primary geomorphic process in these landscapes is fluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the lower elevations on the west side of the unit to 45 inches/114 cms at the highest elevations. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 20 to 65 degrees F/-6 to 18 degrees C.

The Shields River occurs on broad floodplains. The landscape is non-dissected. There are numerous small tributaries, reservoirs and natural wetlands in the valley floor.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include minor amounts of recreational development, logging, mining, grazing and farming.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is the broad valley bottom.

The valley bottom is located on low elevation sites with dominant slope gradients from 0 to 50 percent. These landscapes include floodplain, toeslope and foothill landforms that are formed in rocks, andesitic in composition, but includes aplomerate, conglomerate, sandstone and shale. The valley fill material is generally, water-laid and unconsolidated. The primary soils are deep with textures of silt loam, clay loam and silty clay loam. These soils are classified as Argiborolls and Haploborolls. The dominant potential natural vegetation is typically grass and brushland types with some timber in the draws and on floodplains.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M332Ea Centennial Mountains

Location: This subsection is located in the Upper Snake River Basin of southeastern Idaho.

Subsection Concept: This subsection consists of a ramp-like mountain range along east-west portion of continental divide of extrusive volcanic and sedimentary materials that have been modified by faulting. The major general vegetative types include Western spruce-fir and Douglas fir forest communities. This map unit is separated from similar subsections based upon lithology and the fact that the mountains are east-west trending fault blocks versus north-south trending. Parent material consists of weathered rock overlaid by loess.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 6500 to 9920 feet/2000 to 3000 meters. The dominant slope range is 2 to 60 percent. The dominant types of rocks are rhyolite, sandstone and shale. The primary geomorphic processes in these landscapes are fluvial and colluvial with periglacial and nivational processes on higher ridges.

Mean annual precipitation ranges from 18 inches/46 cms in the valley bottom to 40 inches/102 cms at the mountain tops. Precipitation is uniformly distributed throughout the year with 55 percent of the precipitation falling as snow. The mean annual air temperature is 33 to 36 degrees F/1 to 2 degrees C.

Streams typically occur in valleys. The landscape is highly dissected.

The primary natural disturbance processes are fire and mass failures in sedimentary parent materials. Human-caused disturbances include logging; US Sheep Experiment Station, HQ in Dubois, Idaho, has summer range in central part of range; phosphates were once mined in this subsection.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include dissected tablelands on lower elevations, volcanic dipslopes on mid elevations, and mountains and escarpments on higher elevations.

The lower elevations have a dominant slope gradient from 2 to 15 percent. These landscapes include dissected tablelands that are formed in local alluvium or colluvium derived from loess and rhyolitic tuff. The primary soils are very deep with silt loam and gravelly silt loam surface textures and gravelly through extremely cobbly silt loam and loam subsurface textures. These soils are classified as Typic Paleboralfs, Mollic Paleboralfs and Dystric Cryochrepts. The dominant potential natural vegetation is subalpine fir/grouse blueberry h.t., pinegrass phase. Present vegetation commonly supported includes a lodgepole pine/pinegrass c.t., lodgepole pine/grouse blueberry c.t. and lodgepole pine/nonnative grass communities.

The mid elevations have a dominant slope gradient from 4 to 40 percent. These landscapes include volcanic dipslopes that are moderately to strongly dissected by drainageways that are formed in local alluvium or colluvium derived from mixed volcanic rocks and loess. The primary soils are very deep with silt loam and gravelly silt loam surface textures and gravelly through extremely stony loam and sandy loam subsurface textures. These soils are classified as Typic Cryumbrepts and Mollic Paleboralfs. The dominant potential natural vegetation is subalpine fir/pinegrass h.t., pinegrass phase. Present vegetation commonly supported includes a Douglas-fir/pinegrass, Douglas-fir/mountain snowberry and subalpine fir/subalpine big sagebrush/mountain brome communities.

The high elevations have a dominant slope gradient from 4 to 25 percent on

plateaus and 25 to 60 percent on mountains and escarpments. These landscapes include mountains and plateaus that formed in local alluvium or colluvium derived from mixed volcanic rocks and loess. The primary soils are very deep with gravelly loam to gravelly silt loam surface textures and extremely stony sandy loam to very gravelly coarse sand subsurface textures. These soils are classified as Typic Cryumbrepts and Vitrandic Cryochrepts. The dominant potential natural vegetation is subalpine fir/alpine prickly currant h.t., whitebark pine phase. Present vegetation commonly supported includes a subalpine fir/alpine prickly currant h.t., whitebark pine phase and a subalpine big sagebrush/mountain brome h.t.

Compiled By: Targhee National Forest; Terry Bowerman and Terry Craig
Used map units 1270 for high, 1150 for mid, and 1720 for low

M332Eb Northern Lost River Range

Location: This subsection is located in the Pahsimeroi and Salmon River Basin of Central Idaho, east of Challis.

Subsection Concept: This subsection consists of strongly glaciated uplands and horst elements of the Basin and Range consisting of mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands. The bedrock consists of volcanic and minor amounts of limestone and shale. This area has been modified by glaciation, fluvial, colluvial and alluvial fans. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which contain over steepened V-shaped canyons along Salmon River, on the east and west is valley bottoms of the Basin and Range and south is higher elevation glaciated lands from sedimentary bedrock.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 9,100 feet/1524 to 2774 meters. The dominate slope range is 20 to 80 percent. The dominant types of rocks are volcanics and minor sedimentary. The primary geomorphic processes in these landscapes are glaciation, fluvial, colluvial and alluvial fans.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 30 inches (76cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 33 F. to 48 degrees F. (0.6 to 9 degrees C).

Lawson Creek, Trail Creek, Sulfur Creek, Lime Creek, Hole-In-Rock Creek and Leaton Gulch occur within the area. The landscape ranges from slight to highly dissected. Wetlands occurs in valley bottom locations associated with glacial-fluvial and alluvial deposits.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include recreation, livestock grazing, fire, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of five primary landscape settings. These include mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands.

The mountain slopelands range from low to mid elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam, clay loam and loam. These soils are classified as Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam, loam and clay loam. These soils are classified as Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir and Idaho fescue at mid to

high elevation wetter sites. Willows are found along riparian areas.

The cryic basinlands range from mid to high elevation sites with dominant slope gradients from 30 to 60 percent. This landscape is subdued and the ridgetops are rounded that have been modified by frost action and drainage waters of glaciers and are formed in volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam, loam and clay loam. These soils are classified as Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir and Idaho fescue at mid to high elevation wetter sites. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in volcanics. The primary soils are shallow to moderately deep with textures of gravelly or rocky sandy loam, loam and clay loam. These soils are classified as Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir and Idaho fescue at mid to high elevation wetter sites. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in volcanics. The primary soils are shallow to moderately deep with textures of gravelly or rocky loam and and sandy loam. These soils are classified as Cryoborolls and Cryoboralfs. The dominant potential natural vegetation in shrublands is mountain big sagebrush, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir and Idaho fescue at mid to high elevation wetter sites. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Steven Spencer

M332Ec McCartney Highlands

Location: This subsection is located in the Big Hole and Jefferson river basins in southwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of Archean metamorphics, Proterozoic sediments, Cretaceous intrusives and Tertiary sediments and valley fill that have been modified by glacial and erosional processes. The major general vegetative types are coniferous forests and shrub/grasslands. This map unit is separated from similar subsections based upon geologic structure, parent materials, and climatic factors.

Subsection Setting and General Characteristics: These block faulted mountains have an elevational range of 5,291 to 10,223 feet (1,613 to 3,116 meters). The dominant slope range is 30 to 70 percent. The dominant types of rocks are Archean metamorphics consisting of gneiss and schist; Proterozoic sediments consisting of shale and sandstone; Cretaceous intrusives consisting of granitics and Colorado group volcanics; Tertiary tuffaceous sandstone and siltstone; and Quaternary alluvium. The primary geomorphic processes in these landscapes are glacial, fluvial, colluvial and pluvial.

Mean annual precipitation ranges from 9.04 inches (22.96cm) at Glen to 12.63 (32.08cm) at Divide to about 20 inches (50.80cm) at the higher elevations in the unit. Most precipitation occurs April through September with less than ten percent falling as snow. The mean annual air temperature range is 21.2 to 65.8 degrees F (-6.0 to 18.8 C) at Glen, to 20.2 to 63.2 degrees F (-6.6 to 17.3 C) at Divide.

Most valley bottoms are steep, rocky and narrow; several streams dry up or flow subsurface during summer/fall seasons. The landscape is highly dissected overall. The few wetlands are mostly in valley bottoms associated with fluvial-alluvial deposits.

The primary natural disturbance processes are fire, insects, disease, flooding and mass-wasting. Human-caused disturbances are grazing, mining, roading.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, foothills and montane uplands, and subalpine/alpine landscapes.

The valley bottoms are located mostly at lower and mid elevation sites with dominant slope range of 2 to 20%. These landscapes include alluvial bottoms and glacial outwash that is mostly cobbly and gravelly. The primary soils are moderately deep to deep gravelly sandy loams and gravelly loams. The taxonomic classification of soils are Ustic Torrifuvents; Aquic Calciorthids*; Aquic Eutroboralfs, and Borollic Calciorthids*. The dominant potential natural vegetation is *Artemesia tridentata*/*Agropyron spicatum*; *Agropyron spicatum*/*Bouteloua gracilis*; *Potentilla fruticosa*/*Festuca idahoensis*; *Populus trichocarpa*/*Cornus stolonifera*; and *Salix geyeriana*/*Deschampsia cespitosa* habitat and riparian site types. The foothills and montane uplands are located on mid elevation sites with dominant slope range from 20 to 40 percent. These landscapes include pluvial and colluvial landforms that are formed in gneiss, limestones, and granitics. The primary soils are shallow to moderately deep loams and sandy loams. The taxonomic classification of the soils are Lithic Cryoborolls; Alfic Cryorthents; Dystric Cryochrepts; and carbonatic Typic Cryochrepts. The dominant potential natural vegetation is the Douglas fir and limber pine series; *Artemesia tridentata*/*Festuca idahoensis* series.

The subalpine/subalpine landscapes are located on mid to high elevation sites with dominant slope gradients of 30 to 65 percent. The ridges and plateaus

have slope range of 10 to 20 percent. These landscapes include glaciated slopes, cirques, troughwalls, frost-churned slopes and ridges landforms formed mostly in gneiss, schist and granitics. The primary soils are shallow sandy loams and loamy sands. The taxonomic classification of the soils are Typic Cryorthents; Argic, Lithic, and Typic Cryoborlls and Typic Cryochrepts.

*Aridisols are to be renamed in Montana.

Compiled By: D.J. Svoboda, Beaverhead N.F.

M332Ed Southern Lost River Range

Location: This subsection is located in the Little Lost River and Big Lost River Basins of Central Idaho.

Subsection Concept: This subsection consists of strongly folded sedimentaries of glaciated troughs, moraines and long alluvial fan elements of the Basin and Range consisting of mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. The bedrock consists of limestone, dolomite shale and minor amounts of volcanic. This area has been modified by glaciation, fluvial, morines and depositional fans. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which is high elevation glaciation, on the east and west is valley bottoms of the Basin and Range and south is the Snake River Plains.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 4,500 to 10,612 feet/1372 to 3235 meters. The dominant slope range is 20 to 80 percent. The dominant types of rocks are sedimentary limestone and dolomite with minor amounts of volcanics. The primary geomorphic processes in these landscapes are glaciation, fluvial, morines and depositional fans.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 28 F. to 49 degrees F. (-2 to 9 degrees C).

The following creeks: Pass, Deer, Wet and Brier occur within the area. The landscape ranges from slight to highly dissected. Wetlands occurs in valley bottom locations associated with glacial-fluvial and alluvial deposits.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include recreation, livestock grazing, fire, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands.

The mountain slopelands range from low to mid elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in limestone, dolomite shale and minor amounts of volcanics. The primary soils are moderately deep to very deep with textures of gravelly or rocky sandy loam, loam, clay loam and silt loam. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Cryorthids and Haplargids. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, curl-leaf mountain mahogany, norway sagewort, bluebunch wheatgrass and Idaho fescue. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in limestone, dolomite and shale. The primary soils are moderately deep to deep with textures of gravelly or rocky loam. These soils are classified as Cryochrepts, Cryorthents and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, bluebunch

wheatgrass and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, heartleaf arnica, Idaho fescue, bluebunch wheatgrass, creeping juniper, curl-leaf mountain mahogany, mountain snowberry at mid to high elevation wetter sites and whitebark pine, limber pine at the higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in limestone and dolomite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam. These soils are classified as Cryochrepts, Cryorthents and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, heartleaf arnica, Idaho fescue, bluebunch wheatgrass, creeping juniper, curl-leaf mountain mahogany, mountain snowberry at mid to high elevation wetter sites and whitebark pine, limber pine at the higher elevations. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in limestone and dolomite. The primary soils are shallow with textures of gravelly or rocky loam. These soils are classified as Cryorthents and Cryochrepts. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, heartleaf arnica, Idaho fescue, bluebunch wheatgrass, creeping juniper, curl-leaf mountain mahogany, mountain snowberry at mid to high elevation wetter sites and whitebark pine, limber pine at the higher elevations. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Steven Spencer

M332Ee Morgan - Goat Mountain

Location: This subsection is located in the Salmon River and Lemhi River Basin of Central Idaho, northeast of the Salmon River, along the Continental Divide.

Subsection Concept: This subsection consists of high structural setrending Medicine Lodge thrust plate that has the Continental Divide ridge system (Bitterroot Range/Beaverhead Mountain) containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands. The bedrock consists of granite, granodiorite, lower Belt Supergroup quartzite and minor amounts of volcanics. This area has been modified by dominantly fluvial and colluvial processes. This subsection has a moderate maritime influence on the northern portion of the subsection and drier on the southern. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the south which contain steep V-shaped canyonlands along the Salmon River, Big Hole Basin to the east, the Basin and Range on the south and drier to the southeast along the Continental Divide.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands have an elevation range of 3,500 to 10,300 feet/1067 to 3140 meters. The dominate slope range is 45 to 70 percent. The dominant types of rocks are granite, granodiorite, lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial and colluvial.

Mean annual precipitation ranges from 15 inches (38cm) in the canyon bottoms to 30 inches (76cm) at the higher elevations. Most precipitation occurs in the spring and winter months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 30 F. to 54 degrees F. (-1 to 12 degrees C).

North Fork Salmon River and the following creeks: Sheep, Fourth of July, Tower, Carmen, Kirtley, Geertson, Bohannon, Wimpy, Pratt, Sandy, Kenney, Warm Spring, Pattee, Agency, Yearian, Reese and Peterson occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and few lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, rural development, recreation, livestock grazing, old mining activities, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite and volcanics. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, loams, loamy sands, clay loams on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryorthents, Haploxerolls, Argiborolls and Xerorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is threetip sagebrush, mountain big sagebrush, Wyoming Big sagebrush, bluebunch wheatgrass and cottonwoods. The dominant potential natural forest vegetation at low to mid

elevation has ponderosa pine, bluebunch wheatgrass on the warmer, drier aspects and Douglas-fir, ninebark, pinegrass and Idaho fescue at mid elevation, cool, moist sites. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in lower Belt Supergroup quartzite, granite and granodiorite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, coarse sandy loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is threetip sagebrush, mountain big sagebrush, Wyoming Big sagebrush, bluebunch wheatgrass and cottonwoods. The dominant potential natural forest vegetation at low to mid elevation has ponderosa pine, bluebunch wheatgrass on the warmer, drier aspects and Douglas-fir, ninebark, pinegrass and Idaho fescue at mid to high elevation, cool, moist sites. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, and lower Belt Supergroup quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam, coarse sandy loam and loams. These soils are classified as Cryorthents, Cryoborolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid elevation is threetip sagebrush, mountain big sagebrush, Wyoming Big sagebrush and bluebunch wheatgrass. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge, white spiraea, pinegrass, ninebark, blue huckleberry and Idaho fescue; subalpine fir, smooth woodrush, blue huckleberry, grouse whortleberry and beargrass are at higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge, white spiraea, pinegrass, ninebark, blue huckleberry and Idaho fescue; subalpine fir, whitebark pine, smooth woodrush, blue huckleberry, grouse whortleberry and beargrass are at higher elevations. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows are found throughout the area along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge, white spiraea, pinegrass, ninebark, blue huckleberry and Idaho fescue; subalpine fir, whitebark pine, smooth woodrush, blue huckleberry, grouse whortleberry and beargrass are at higher elevations. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The dissected foothill lands are found at low to mid elevation sites with

dominant side slope gradients from 35 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and U-shaped valleys that were formed in lower Belt series and Challis Volcanics. The primary soils are moderately deep to deep with textures of loam, sandy loams, clay loams, sandy clay loams, clay and silty clay loams. These soils are classified as Cryorthents, Cryoborolls, Cryochrepts, Cryoboralfs, Haploxerolls, Xerorthents, Haploxeralfs and Cryaquolls. The dominant potential natural vegetation in shrublands at low to mid elevation is threetip sagebrush, mountain big sagebrush, Wyoming Big sagebrush, bluebunch wheatgrass and cottonwoods. The dominant potential natural forest vegetation at low to mid elevation has ponderosa pine, Douglas-fir, bluebunch wheatgrass and Idaho fescue on the warmer, drier aspects. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ef Goat Mountain - Chamberlain Basin

Location: This subsection is located in Lemhi River Basin of Central Idaho, east of Leadore.

Subsection Concept: This subsection consists of the Beaverhead Mountains, Bitterroot Range which is part of the Medicine Lodge thrust plate and intrusion of Beaverhead Pluton containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands. The bedrock consists of granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, dolomite and limestone. This area has been modified by fluvial glacial, frost churning and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which has more rainfall, Basin and Range to the south and west and east is a north-south trending fault block mountain range.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands have an elevation range of 6,500 to 10,773 feet/1982 to 3284 meters. The dominate slope range is 15 to 70 percent. The dominant types of rocks are granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, dolomite and limestone. The primary geomorphic processes in these landscapes are fluvial glacial, frost churning and mass wasting.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 23 inches (59cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 27 F. to 41 degrees F. (-3 to 5 degrees C).

Little Eight Mile Creek, Canyon Creek, Hawley Creek, Big Bear Creek, Ten Mile Creek and Clear Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and numerous lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, erosion, recreation, livestock grazing, old mining activities, forest management and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, clay loams, loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryoboralfs, Cryochrepts, Haplargids, Camborthids, Cryorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands from low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, willows, bluebunch wheatgrass and Idaho fescue.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are

smooth or may be dissected by many V-shaped drainages formed in granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, silt loams, loamy coarse sands, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxeralfs, Haploxerolls, Calcixerolls, Cryoborolls, Cryoboralfs, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands from low to high elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir and pinegrass at mid-elevation cooler sites. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, silt loams and loams. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Cryochrepts, Paleborolls. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands from low to high elevation is Wyoming big sagebrush, mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, hearleaf arnica at mid-elevation cooler sites; subalpine fir, whitebark pine, grouse whortleberry and hearleaf arnica at the higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in limestone and dolomite. The primary soils are shallow to moderately deep with textures of gravelly or rocky loam and silt loam. These soils are classified as Cryorthents and Cryoborolls. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands from mid to high elevation is Wyoming big sagebrush, mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, hearleaf arnica at mid-elevation cooler sites; subalpine fir, whitebark pine, grouse whortleberry and hearleaf arnica at the higher elevations. Willows are found along riparian areas.

The strongly glaciated lands are found at high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are shallow to deep with textures of gravelly or rocky loam, sandy loams and silty clay loams. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands from mid to high elevation is Wyoming big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, hearleaf arnica at mid-elevation cooler sites; subalpine fir, whitebark pine, grouse whortleberry and hearleaf arnica at the higher elevations. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The dissected foothill lands are found at low to mid elevation sites with dominant side slope gradients from 35 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and U-shaped valleys that were formed in dolomite and limestone. The primary soils are deep with textures of silt loams and clay loams. These soils

are classified as Cryorthents, Cryochrepts, Xerochrepts, Haplargids, Haploxeralfs and Calciorthids. The dominant potential natural vegetation in shrublands from low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Eg Lemhi Valley

Location: This subsection is located in the Lemhi River and Birch Creek Basins of Central Idaho.

Subsection Concept: This subsection consists of valleys filled with old lake basin materials, fan terraces, foothills, glacial fan depositional lands and alluvial deposited flood plains of old former Salmon river system which is part of the grabens of southeast Idaho, Basin and Range. The material consists of Miocene- Recent lake bed and river deposits consisting of shales, sandstones, bentonite clays, conglomerates and Quaternary glacial alluvial fan and terrace material consisting of quartzite, volcanics and sedimentary rocks from adjacent mountain ranges. The major general vegetation types include grasslands, shrublands and deciduous trees. This map unit is separated from similar subsection to the north, east and west which is high elevation mountain ranges and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These valleys of depositional materials and low dissected foothills have an elevation range of 4,000 to 7,200 feet/1219 to 2195 meters. The dominate slope range is 1 to 65 percent. The dominant types of material consists of Miocene- Recent lake bed and river deposits consisting of shales, sandstones, bentonite clays, conglomerates and Quaternary glacial alluvial fan and terrace material consisting of quartzite, volcanics and sedimentary rocks from adjacent mountain ranges. The primary geomorphic processes in these landscapes are fluvial, mass wasting and aeolian.

Mean annual precipitation ranges from 7 inches (18cm) at low elevation near Salmon to 20 inches (51cm) at the higher elevations of Gilmore Summit. Most precipitation occurs in the summer months. Thirty percent of the precipitation falls as snow. The mean annual temperature is from 40 F. to 51 degrees F. (4 to 11 degrees C).

Salmon River, Lemhi River and the following major creeks: Tower, Carmen, Kirtley, Geertson, Bohannon, Wimpey, Kenney, Pattee, Agency, McDevitt, Hayden, Yearian, Mill, Big Eightmile, Reese, Peterson, Little Eightmile, Big Timber, Canyon, Hawley, Texas, Meadow Lake, Tenmile, Eighteenmile and Birch occur within the area. The landscape ranges from slight to highly dissected. Wetlands occurs in valley bottom alluvial deposits.

The primary natural disturbance processes are fire and erosion. Human-caused disturbances include rural development, recreation, farming, mining, fire, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include flood plains, dissected foothills and fan terraces.

The flood plains formed in alluvium lands range from low to mid elevation sites with dominant slope gradients from 1 to 5 percent. This landscape includes slopes that are smooth or may be dissected by many small V and U-shaped drainages formed in alluvium from quartzite, limestone, dolomite and minor amounts of volcanics. The primary soils are moderately deep to very deep with textures of gravelly sandy loam, loam, clay loam, clay, silt loam and sand. Some areas are underlain with calcic horizons and have lime throughout the soil. Soils are classified as Calciorthidic Haploxerolls, Fluventic Haploxerolls and Cumulic Cryaquolls. The dominant potential natural vegetation at low to mid elevation is Wyoming big sagebrush, silver sagebrush, Idaho fescue, carex, willows, deschampsia, cottonwoods, western wheatgrass and inclusions of bluebunch wheatgrass.

The dissected foothill lands are found at low to mid elevation sites with dominant side slope gradients from 8 to 65 percent. This landscape has low

relief hills that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Low foothills near Salmon contain bentonite clay soils. Some areas are underlain with calcic horizons and have lime throughout the soil while others contain duripans which interfere with root growth. These soils are classified as Argic Cryoborolls, Argic Pachic Cryoborolls, Argic Lithic Cryoborolls, Calcic Cryoborolls, Calcic Pachic Cryoborolls, Calcic Argixerolls, Xerollic Haplargids, Dystric Cryochrepts, Xerollic Natrargids, Vertic Palexerolls and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, Idaho fescue, willows, cottonwoods, bluebunch wheatgrass, western wheatgrass, aspens in draws and inclusions of curl-leaf mountain mahogany on the rocky hillsides.

The fan terrace lands are found at low to mid elevation sites with dominant side slope gradients from 1 to 20 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Some areas are underlain with calcic horizons and have lime throughout the soil while others contain duripans which interfere with root growth. These soils are classified as Argic Cryoborolls, Typic Cryoborolls, Duric Cryoborolls, Xerollic Camborthids, Typic Calciorthids, Xerollic Calciorthids, Xerollic Durothids and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, Idaho fescue, willows, cottonwoods, bluebunch wheatgrass, western wheatgrass, aspens in draws and inclusions of Rocky mountain juniper.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Cliff Keene

M332Eh Northern Lemhi Range

Location: This subsection is located in part of the Salmon and Lemhi River Basin of Central Idaho, between the Salmon River on the west and the Lemhi River on the east.

Subsection Concept: This subsection consists of horst (raised fault block mountain lands-Medicine Lodge thrust plate) which is part of the Basin and Range, containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands. The bedrock consists of granite, quartz monzonite, metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite, volcanics, dolomite and limestone. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north, east and south which contain old lake basin material, old alluvial deposits and Salmon Mountains front on the west.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands have an elevation range of 5,000 to 10,900 feet/1524 to 3323 meters. The dominate slope range is 20 to 70 percent. The dominant types of rocks are metamorphosed pre-cambrian intrusive augen gneiss, schists, lower Belt Supergroup quartzite, volcanics, dolomite, limestone and minor amounts of granite and quartz monzonite. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 35 inches (89cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 27 F. to 48 degrees F. (-3 to 9 degrees C).

Hayden Creek, Big Eight Mile Creek, Big Timber Creek, Twelve Mile Creek, Warm Spring Creek, Poison Creek and McKim Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits. Numerous lakes occur in the high elevation cirque basins.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, rural development, old mining activities, recreation, livestock grazing, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, clay loams, loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryoboralfs, Cryochrepts, Haplargids, Camborthids, Cryorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Wyoming big sagebrush, cottonwoods, bluebunch wheatgrass and Idaho fescue. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, silt loams, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxeralfs, Haploxerolls, Calcixerolls, Cryoborolls, Cryoboralfs, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Wyoming big sagebrush, cottonwoods, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir and pinegrass on the cool, mid to high elevation sites. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, lower Belt Supergroup quartzite, volcanics, limestone and dolomite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, silt loams and loams. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Cryochrepts, Paleborolls. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, Idaho fescue at mid-elevation wetter sites; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in granite, quartz monzonite, volcanics, lower Belt Supergroup quartzite, limestone and dolomite. The primary soils are shallow to deep with textures of gravelly or rocky loam, silt loams, loamy sand and sandy loams. These soils are classified as Cryorthents, Cryoboralfs, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, Idaho fescue at mid-elevation wetter sites; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite, quartz monzonite, lower Belt Supergroup quartzite, limestone and dolomite. The primary soils are shallow to deep with textures of gravelly or rocky loam, sandy loams and silty clay loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is Douglas-fir, pinegrass, Idaho fescue at mid-elevation wetter sites; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. The highest areas are of alpine zones with rock outcrop and rubblelands. Willows are found along riparian areas.

The dissected foothill lands are found at low to mid elevation sites with dominant side slope gradients from 35 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and U-shaped valleys that were formed in lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of loam, sandy loams, clay loams, sandy clay loams, clay and silty clay loams. These soils are classified as Cryorthents, Cryoborolls, Cryochrepts, Cryoboralfs, Cryaquolls and Haploxeralfs. The dominant potential

natural vegetation in shrublands is Wyoming big sagebrush and bluebunch wheatgrass. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ei Central Lost River Range

Location: This subsection is located in the Southern Pahsimeroi, Northern Little Lost River and Big Lost River Basins of Central Idaho.

Subsection Concept: This subsection consists of strongly folded, uplifts with strongly glaciated uplands, moraines and long alluvial fan elements of the Basin and Range consisting of mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. The bedrock consists of limestone, dolomite, shale and minor amounts of volcanic. This area has been modified by glaciation, fluvial, morines and depositional fans. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which mostly volcanics, on the east and west is valley bottoms of the Basin and Range and south is lower elevation glaciated lands from sedimentary bedrock.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 12,662 feet/1524 to 3860 meters. The dominate slope range is 20 to 80 percent. The dominant types of rocks are sedimentary limestone, shale and dolomite with minor amounts of volcanics. The primary geomorphic processes in these landscapes are glaciation, fluvial, morines and depositional fans.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 22 F. to 48 degrees F. (-5 to 9 degrees C).

The following creeks: Grouse, Doublesprings, Willow, Mahogany, Pahsimeroi, Burnt, Long Lost, Big, Bear, Upper Cedar, Lower Cedar, Lone Cedeer, Birch, Wet and Dry occur within the area. The landscape is highly dissected. Wetlands occurs in valley bottom locations associated with glacial-fluvial and alluvial deposits.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, livestock grazing, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands.

The mountain slopelands range from low to mid elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in limestone and volcanics. The primary soils are moderately deep to very deep with textures of gravelly or rocky sandy loam, loam, clay loam and silt loam. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Cryorthids and Haplargids. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid-elevation is Wyoming big sagebrush, norway sagewort and bluebunch wheatgrass. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in limestone and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky loam, loam and clay loam. These soils are classified as Cryoborolls, Cryoboralfs and Cryorthids. Inclusions of

Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, Idaho fescue, heartleaf arnica and creeping juniper at mid to high elevation wetter sites. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in limestone and shale. The primary soils are shallow to moderately deep with textures of gravelly or rocky sandy loam, loam and clay loam. These soils are classified as Cryoborolls and Cryochrepts. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, Idaho fescue, heartleaf arnica and creeping juniper at mid to high elevation wetter sites and whitebark pine and limber pine at higher elevation. The highest elevation is alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in limestone and shale. The primary soils are shallow to moderately deep with textures of gravelly or rocky loam and sandy loam. These soils are classified as Cryochrepts and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, curl-leaf mountain mahogany, Idaho fescue and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir, subalpine fir, Idaho fescue, heartleaf arnica and creeping juniper at mid to high elevation wetter sites and whitebark pine and limber pine at higher elevation. The highest elevation is alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Steven Spencer

M332Ek Southern Lemhi Range

Location: This subsection is located in the Lemhi River, Birch Creek and Little Lost River Basins of Central Idaho.

Subsection Concept: This subsection consists of strongly glaciated, Basin and Range consisting of mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. The bedrock consists of limestone and dolomite. This area has been modified by glaciation, fluvial, colluvial and depositional fans. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which contains horst, grabens of Southeast Idaho to the east and west, and the Snake River Plains to the south.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 12,197 feet/1524 to 3719 meters. The dominate slope range is 20 to 80 percent. The dominant type of rock is limestone and dolomite. The primary geomorphic processes in these landscapes are glaciation, fluvial and depositional fans.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 30 inches (76cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 24 F. to 48 degrees F. (-4 to 9 degrees C).

South Creek, Uncle Ike Creek, Badger Creek, Williams Creek and Little Lost River occur within the area. The landscape ranges from slight to highly dissected with glacial-fluvial and alluvial deposits. Few high elevation lakes occur in cirque basins.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include old mining activities, erosion, livestock grazing, recreation, fire, forest management and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands.

The mountain slopelands range from mid to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in limestone. The primary soils range from shallow to deep with textures of gravelly or rocky sandy loam, loam, clay loam and silt loam. These soils are classified as Cryorthents, Cryochrepts and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid-elevation is mountain big sagebrush, Wyoming big sagebrush, curl-leaf mountain mahogany, Rocky Mountain Juniper and bluebunch wheatgrass. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in limestone. The primary soils are moderately deep to deep with textures of gravelly or rocky loam. These soils are classified as Cryochrepts and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid-elevation is mountain big sagebrush, curl-leaf mountain mahogany, Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, mountain snowberry, heartleaf arnica, common juniper at mid to high elevation wetter sites. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes V and U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in limestone. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam. These soils are classified as Cryochrepts and Cryoborolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, mountain snowberry, heartleaf arnica, common juniper at mid to high elevation wetter sites and subalpine fir and Limber pine at the higher elevations. The highest elevations are alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in limestone. The primary soils are shallow with textures of gravelly or rocky loam. These soils are classified as Cryochrepts, Cryorthents, Cryoborolls and Cryumbrepts. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation is Douglas-fir, mountain snowberry, heartleaf arnica, common juniper at mid to high elevation wetter sites and subalpine fir and limber pine at the higher elevations. The highest elevations are alpine zone with rock outcrop and rubbleland. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Steven Spencer

M332E1 Allan - Morgan Mountain

Location: This subsection is located in the North Fork of the Salmon River Basin of Central Idaho, between Lost Trail Pass on the north and the Salmon River on the south.

Subsection Concept: This subsection consists of strongly faulted, folded, uplifted ridge system which is part of the Medicine Lodge thrust plate, containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. The bedrock consists of granite, granodiorite, lower Belt Supergroup quartzite, and volcanics. This area has been modified by dominantly fluvial processes. This subsection has a moderate maritime influence. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the south which contain steep V-shaped canyonlands along the Salmon River and the high structural, high elevation ridge system to the east.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands have an elevation range of 3,500 to 9,154 feet/1067 to 2791 meters. The dominate slope range is 45 to 70 percent. The dominant types of rocks are granite, granodiorite, lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial and mass wasting.

Mean annual precipitation ranges from 15 inches (38cm) in the canyon bottoms to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 33 F. to 54 degrees F. (0.6 to 12 degrees C).

North Fork Salmon River, Hull Creek, Hughes Creek, Dahlenega Creek and Sheep Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and few lakes occur in the high elevation cirque basins.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, rural development, recreation, livestock grazing, old mining activities, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of five primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, loams and loamy sands on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryorthents, Haploxerolls and Xerorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at low elevation is mountain big sagebrush, cottonwoods and bluebunch wheatgrass. The dominant potential natural forest vegetation at low to mid elevation has influences of ponderosa pine and bluebunch wheatgrass on the warmer, drier aspects and Douglas-fir, ninebark, pinegrass, bluebunch wheatgrass and Idaho fescue on the cooler, aspects. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant

slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in lower Belt Supergroup quartzite, volcanics, granite and granodiorite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, silt loams, clay, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Cryoboralfs, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, cottonwoods and bluebunch wheatgrass. The dominant potential natural forest vegetation at low to mid elevation has influences of ponderosa pine and bluebunch wheatgrass on the warmer, drier aspects and Douglas-fir, ninebark, pinegrass, bluebunch wheatgrass and Idaho fescue on the cooler, higher elevations. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite, and lower Belt Supergroup quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam, sandy clay loam, coarse sandy loam and loams. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge and white spiraea; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge and white spiraea; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. Minor inclusions of alpine zone, rock outcrop and rubbleland are found at the highest elevations. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, elk sedge and white spiraea; subalpine fir, whitebark pine and grouse whortleberry at higher elevations. Minor inclusions of alpine zone, rock outcrop and rubbleland are found at the highest elevations. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Em Salmon Mountains Front

Location: This subsection is located in the Salmon River Basin of Central Idaho, south of Salmon on the west of the Salmon River.

Subsection Concept: This subsection consists of uplifted mountain range where the Northern Rocky Mountains meet the open Northern Rockies containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands. The bedrock consists of lower Belt Supergroup quartzite and volcanics. This area has been modified by fluvial, colluvial and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north by Structural Front, horst to the east, Basin and Uplands to the west and anticline to the south.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands have an elevation range of 3,000 to 10,000 feet/914 to 3049 meters. The dominate slope range is 20 to 75 percent. The dominant types of rocks are lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial and mass wasting.

Mean annual pre+ipitation ranges from 10 inches (25cm) in the canyon bottoms to 25 inches (64cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 30 F. to 56 degrees F. (-1 to 13 degrees C).

Salmon River, Iron Creek, Hat Creek, Ellis Creek, Ezra Creek and Morgan Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and few lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, erosion, rural development, recreation, livestock grazing, old mining activities, forest management and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in lower Belt Supergroup quartzite and volcanics. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, loams and clay loams on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryorthents, Haploxerolls, Argiborolls and Xerorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass, Idaho fescue and cottonwoods. The dominant potential natural forest vegetation at mid elevation wetter sites is Douglas-fir and pinegrass. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to

deep with textures of gravelly or rocky sandy loams, loam, silt loam and clay loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Argixerolls, Xerochrepts and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass, Idaho fescue and cottonwoods. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, grouse whortleberry and pinegrass. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in volcanics and lower Belt Supergroup quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam and loams. These soils are classified as Cryorthents, Cryoborolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, grouse whortleberry and pinegrass. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in lower Belt Supergroup quartzite and volcanics. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryochrepts and Argiborolls. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, grouse whortleberry and pinegrass. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in volcanics and lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryoborolls, Argixerolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, grouse whortleberry and pinegrass. Willows are found along riparian areas.

The dissected foothill lands are found at low to mid elevation sites with dominant side slope gradients from 35 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and U-shaped valleys that were formed in lower Belt Supergroup quartzite and volcanics. The primary soils are moderately deep to deep with textures of loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. These soils are classified as Cryoborolls, Cryochrepts, Cryoborolls, Haploxerolls, Haploxerolls, Xerochrepts, Xerorthents and Cryaquolls. The dominant potential natural vegetation in shrublands is Wyoming big sagebrush and bluebunch wheatgrass. Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332En Salmon Front

Location: This subsection is located in the Salmon River Basin of Central Idaho, west of Salmon and on the east side of the Salmon River Mountains.

Subsection Concept: This subsection consists of Structural Front above the Salmon Basin, on the east side of the Salmon River Mountains containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands. The bedrock consists of granite, quartz monzonite, lower Belt Supergroup quartzite and volcanics. This area has been modified by dominantly fluvial, colluvial, mass wasting and frost churning. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north and east by the Basin and Range, on the south by uplifted mountain range and on the west the Basin and Uplands.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands have an elevation range of 4,000 to 9,274 feet/1219 to 2827 meters. The dominate slope range is 15 to 65 percent. The dominant types of rocks are granite, quartz monzonite, lower Belt Supergroup quartzite and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, mass wasting and frost churning.

Mean annual precipitation ranges from 10 inches (25cm) in the canyon bottoms to 25 inches (64cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 33 F. to 51 degrees F.(0.6 to 11 degrees C).

Salmon River, Rattlesnake Creek, Lake Creek, Williams Creek, Perreau Creek, Chips Creek, Jesse Creek, Bob Moore Creek, Fenster Creek, Wallace Creek and Diamond Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and few lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include fire, rural development, recreation, livestock grazing, old mining activities, forest management, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and dissected foothill lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite, quartz monzonite, lower Belt Supergroup quartzite and volcanics. The primary soils are very shallow to moderately deep with textures of gravelly or rocky sandy loams, loams, loamy sands, clay loams on the uplands and stratified fluvial deposits of sands and gravels on the alluvial bottoms. These soils are classified as Cryoborolls, Cryorthents, Haploxerolls, Argiborolls and Xerorthents on the uplands and Cryaquolls in the riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, cottonwoods and bluebunch wheatgrass. The dominant potential natural forest vegetation at mid elevation wetter sites is Douglas-fir and pinegrass. Willows occur in riparian areas.

The mountain slopelands range from low to high elevation sites with dominant

slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in lower Belt Supergroup quartzite, granite, quartz monzonite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, coarse sandy loams, loam, silt loam and clay loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Argixerolls and Xerorthents. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, cottonwoods and bluebunch wheatgrass. The dominant potential natural forest vegetation at mid elevation wetter sites is Douglas-fir and pinegrass. Willows occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in volcanics and lower Belt Supergroup quartzite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loam and loams. These soils are classified as Cryorthents, Cryoborolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid elevation wetter sites is Douglas-fir, Idaho fescue, pinegrass; subalpine fir, beargrass, pinegrass and grouse whortleberry at the higher elevations. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid to high elevation is mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, Idaho fescue, pinegrass; subalpine fir, pinegrass and grouse whortleberry at the higher elevations. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in volcanics and lower Belt Supergroup quartzite. The primary soils are shallow to deep with textures of gravelly or rocky loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryoboralfs, Argixerolls and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, Idaho fescue, pinegrass; subalpine fir, beargrass, pinegrass and grouse whortleberry at the higher elevations. Willows are found along riparian areas.

The dissected foothill lands are found at low to mid elevation sites with dominant side slope gradients from 35 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and U-shaped valleys that were formed in volcanics. The primary soils are moderately deep to deep with textures of loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. These soils are classified as Cryoborolls, Cryoboralfs, Haploxerolls, Haploxeralfs, Xerorthents and Cryaquolls. The dominant potential natural vegetation in shrublands is Wyoming big sagebrush and bluebunch wheatgrass. The dominant potential natural forest vegetation is Douglas-fir and pinegrass. Willows are

found along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Ep East Pioneer - Fleecer Mountains

Location: This subsection is located in the Big Hole River basin of southwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of predominantly Cretaceous limestone, including minor volcanic rock and unconsolidated Quaternary deposits, that have been modified by alpine glaciation. The major general vegetative types include alpine turf, subalpine and dry coniferous forests, and sagebrush/grasslands. This map unit is separated from similar subsections based upon parent material and climate/vegetative factors.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 6,000 to 9,500 feet/1829 to 2896 meters. The dominant slope range is 15 to 65 percent. The dominant types of rocks are Cretaceous sediments consisting mostly of limestone. There are notable inclusions of Tertiary volcanic rocks and Cretaceous to Tertiary plutonic intrusive rocks consisting mainly of granite. The primary geomorphic processes in these landscapes are glacial and residual.

Mean annual precipitation ranges from 10 inches adjacent to the valley floor to 20 inches at the higher elevations in this mountainous unit (25 to 50 cm). Most precipitation occurs in the spring with less than ten percent of the precipitation falling as snow. The mean annual air temperature is approximately 27.8 to 57.6 degrees F; -2.3 to 14.2 C.

Streams and rivers typically occur on valley bottoms modified by alpine glaciation. The landscape is weakly to moderately dissected with third order streams occurring about every mile. First order tributaries to these occur about every quarter mile. Wetlands occur in cirques, nivalational basins, and valley bottoms associated with both alluvial deposits, and residual geomorphic surfaces associated with hillslope structure. Lakes occur in few of the wider valley bottoms.

The primary natural disturbance processes are fire, insects, disease, windthrow, flooding. Human-caused disturbances include rural development logging, mining, grazing, and recreational development.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These are: valley bottoms, montane uplands, and subalpine and alpine slopes and ridgetops.

The valley bottoms are located on low to high elevational sites with dominant slope gradients from 0.5 to 10 percent. These landscapes include fluvial-alluvial bottoms in stratified deposits largely of cobble, gravel and silts. The predominant soils are moderately deep to deep silt loams to loamy sands and gravels. Soil taxonomic classifications are predominately Mollic and Aquic Cryofluvents, Histic Aquic and Typic Cryoborolls. The dominant potential natural vegetation is Douglas fir, subalpine fir, spruce and White bark pine series in coniferous tree cover types, and the *Festuca idahoensis*, *Deschampsia cespitosa*, *Carex*, *Salix*, series is non-timber cover types.

The montane uplands are located in mid-elevational zones with dominant slopes of 20 to 45%. These landscapes include glacially scoured, colluvial, and residual landforms in limestone, volcanic, and granitic parent materials. The predominant soils are shallow to deep siltloams, gravelly silt loams, loams and gravelly loams. The predominant soil taxonomic classifications are Typic and Calcic Cryoborolls, Alfic and Typic Cryochrepts, Mollic and Typic Cryoborolls, and Lithic Calciborolls. The dominant potential natural vegetation are the Douglas-fir, subalpine fir and whitebark pine series in coniferous forest cover types, and *Agropyron spicatum*, *Festuca idahoensis*,

Artemisia tridentata series in grassland cover types.

The subalpine and alpine slopes and ridgetops are at the highest elevations with slopes ranging from 10 to 70%. These landscapes include glacially scoured, and residual landforms in limestone, volcanic and granitic parent materials. The predominant soils are shallow to moderately deep silt loams and gravelly silt loams and loams. The predominant soil taxonomic classifications are Lithic and Typic Cryoborlls, Typic Cryochrepts, Lithic, and Aquic Cryorthents. The predominant potential natural vegetation is subalpine fir-whitebark pine series and *Deschampsia cespitosa*, *Carex scirpoidia*, *Geum rossii*, and *Carex scopulorum* series.

Compiled By: Beaverhead National Forest, Daniel Svoboda

M332Eq Deer Lodge Valley

Location: This subsection is located in the Clark Fork River Basin of Southwestern Montana.

Subsection Concept: This subsection consists of an intermontane valley of Tertiary sedimentary rock and Quaternary stream deposits that have been modified by stream erosion and mass wasting. The major vegetative types include grasslands and shrublands. This map unit is separated from similar subsections based upon the presence of rough fescue and traces of the maritime climatic influence.

Subsection Setting and General Characteristics: This intermontane valley has an elevational range of 4400 to 6000 feet (1340 to 1830 meters). The dominant slope range is 0-35 percent. The dominant types of rocks are Tertiary sedimentary rocks. The primary geomorphic processes in this landscape are fluvial and mass wasting.

Mean annual precipitation ranges from 11 to 16 inches (28 to 42 centimeters). Most precipitation occurs in the spring and summer with 10 to 20 percent of the precipitation falling as snow. The mean annual air temperature is 41 to 44 degrees F (5 to 7 degrees C).

Most of the streams originating in the subsection are intermittent. Perennial streams originate outside of the subsection and flow through it. They occupy narrow floodplains that have been cut into pediments, alluvial fans, and stream terraces. The Clark Fork River occupies a relatively broad floodplain through the center of the subsection. The landscape is moderately dissected with areas of high dissection. Wetlands occur within the floodplains of perennial streams and on mass wasted landforms. A few lakes occur on mass wasted landforms as sagponds.

The primary natural disturbance processes are flooding, fire, and mass failures. Human-caused disturbances include copper smelting, crop production, haying, grazing, reservoirs, and urban/suburban development.

Subsection Ecological Relationships: This subsection consists of three primary landscape settings. They are floodplains, terraces, and pediments and alluvial fans.

The floodplains are located on low elevation sites with dominant slope gradients from 0 to 5 percent that have formed in Recent alluvium. The primary soils are deep with a variety of textures. They are classified as Typic Haplaquolls, Argiborolls, and Haploborolls. The dominant potential natural vegetation is sedge, willow, and bunchgrass habitat type series, and cottonwood community type series.

The terraces are located at mid elevations in the subsection with dominant slope gradients from 0 to 10 percent that have formed in Recent alluvium. The primary soils are deep loams and cobbly loams. They are classified as Typic Argiborolls, Calciborolls, Haploborolls, and Aridic Haploborolls. The dominant potential natural vegetation is rough fescue and bluebunch wheatgrass habitat type series.

The pediments and alluvial fans are located at mid and high elevations in the subsection with dominant slope gradients from 5 to 20 percent. These landforms have formed in Tertiary sedimentary rocks. The primary soils are deep loams and clay loams. They are classified as Aridic and Typic Argiborolls and Haploborolls. The dominant natural vegetation is rough fescue and bluebunch wheatgrass habitat type series.

Compiled by: Deerlodge National Forest, Dave Ruppert.

M332Er Highland Mountains/Rochester Basin

Location: This subsection is located in the Upper Missouri River Basin of southwestern Montana.

Subsection Concept: This subsection consists of a basin bounded on the north and south by block faulted mountains of granitics, gneiss, and a variety of sedimentary and metasedimentary bedrock that have been modified by stream dissection. The major vegetation types include coniferous forests, shrublands, and grasslands. This map unit is separated from similar subsections based upon the variety of bedrock and the presence of a basin without Tertiary sedimentary rocks.

Subsection Setting and General Characteristics: This basin/mountain combination has an elevation range of 5500 to 10,200 feet (1670 to 3100 meters). The dominant slope range is 10 to 30 percent in the basin and 25 to 65 percent in the mountains. The dominant types of rocks are granitic, gneiss, and argillite. The primary geomorphic process in this landscape is fluvial.

Mean annual precipitation ranges from 12 inches (30 centimeters) in the basin to 30 inches (76 centimeters) in the mountains. Most precipitation occurs in the spring and summer with 10 to 35 percent falling as snow. The mean annual air temperature is 34 to 42 degrees F (1 to 6 degrees C).

The landscape is moderately and highly dissected by streams, mostly intermittent. Wetlands and lakes occur in the Highland Mountains but are a minor component of the subsection.

The primary natural disturbance processes are fire and insects. Human-caused disturbances include mining, logging, roads, and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. They are the basin and the mountains.

The basin is located on low to mid elevation sites with dominant slope gradients of 10 to 30 percent. This landscape includes structurally controlled benches and stream channels that are formed in gneiss bedrock. The primary soils are shallow and moderately deep cobbly loams and sandy loams. They are classified as Lithic and Typic Argiborolls, Calciborolls, and Camborthids. The dominant potential natural vegetation is sagebrush, Idaho fescue, and bluebunch wheatgrass habitat type series.

The mountains are located on mid to high elevation sites with dominant slope gradients from 25 to 65 percent. These mountains include stream dissected mountain slopes with a limited area of glacial cirques and troughs that are formed in granitic, gneiss, and argillite bedrock. The primary soils are cobbly and gravelly loams and sandy loams. They are classified as Typic and Lithic Cryoborolls, Cryochrepts, and Cryoboralfs. The dominant potential natural vegetation is subalpine fir, Douglas fir, sagebrush, and Idaho fescue habitat type series.

Compiled by: Deerlodge National Forest, Dave Ruppert.

M332Es Anaconda Range

Location: This subsection is located in the Big Hole river basin of southwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of Cretaceous monzonite and granodiorite that have been altered by alpine glaciation. The major general vegetative types include montane coniferous forest, subalpine forest and alpine turf. This map unit is separated from similar subsections based upon geologic structure and parent material.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 6,050 to 10,875 (1,844 to 3,315). The dominant slope range is 25-45%. The dominant types of rocks are older Cretaceous, Idaho batholith and associated masses; monzonite and granodiorite. The primary geomorphic processes in these landscapes are glacial, fluvial, and frost-churning.

Mean annual precipitation ranges from 20 to 30 inches (51 to 76 cm), varying by elevation. Most precipitation occurs in the spring, with about 15% of the precipitation falling as snow. The mean annual air temperature is 14.6 to 58.2 degrees F (-15.2 to 14.6 degrees C) at Wisdom.

Valley bottoms are typically narrow and steep-sided with first order streams. Second and third order streams occur in valley bottoms near the bases of the mountains in the foothills and in the upper reaches of the Big Hole river basin. The landscape is moderately dissected. Wetlands are mostly associated with the larger valley bottoms, and with glacial outwash near the river basin.

The primary natural disturbance processes are fire, insects, disease. Mass-wasting is uncommon. Human-caused disturbances include rural development, logging roads, livestock grazing and wild ungulate populations that are outside of historical numbers.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include the valley bottoms, the montane to subalpine forests, and the high elevation landscapes.

The valley bottoms are located on low to mid elevation sites with slopes from 1 to 15%. These landscapes include alluvial bottoms, and glacial troughs in granitic parent materials. The primary soils are deep silts and sands. Taxonomically, they are Typic Cryorthents and Typic Cryoborolls. The dominant potential natural vegetation is Douglas fir, subalpine fir and englemann spruce series; *Salix geyeriana*, *S. planifolia*, and *S. wolfii* series; and *Calamagrostis canadensis*, *Carex utriculata*, and *Deschampsia cespitosa* communities.

Montane to subalpine landscapes are on mid and upper elevations with slopes from 15 to 45 percent. These landscapes include glaciated slopes, colluvial slopes, and frost-churned slopes and ridges formed in glacial till and granitic parent materials. The primary soils are shallow to moderately deep loamy sands and sandy loams. The soil taxonomic classifications are Typic Cryochrepts, Typic Cryorthents and Typic Cryoboralfs. The dominant potential natural vegetation is the subalpine fir and Douglas fir series.

The alpine landscapes are located on the higher elevation sites with dominant slope range of 20 to 70 percent. This landscape is composed of glacial cirques, basins, troughwalls and structural landforms formed in residual granitic bedrock and glacial till. There is an insignificant amount of volcanics. The primary soils are shallow to moderately deep gravelly sandy loams and loamy sands. Taxonomically they are in the Lithic and Typic Cryochrept subgroups. The dominant potential natural vegetation is the

subalpine fir and whitebark pine series; *Carex elynoides*, *Dryas octopetala*,
and *Carex scirpoidea* communities.

Compiled By: Daniel Svoboda, Beaverhead National Forest

M332Et Beaverhead Range

Location: This subsection is located in the Big Hole river basin of southwestern Montana

Subsection Concept: This subsection consists of fault block mountains of undivided Belt Supergroup rocks that have been modified by alpine glaciation. The major general vegetative types include coniferous forest, grass/shrublands, and alpine turf. This map unit is separated from similar subsections based upon geologic structure and parent material.

Subsection Setting and General Characteristics: These mountains have an elevation range of 6,800 to 10,630 feet (2,073 to 3,240 m). The dominant slope range is 20 to 65 percent. The dominant types of rocks are metamorphosed sediments of the Precambrian Y Belt Supergroup, mostly fine to coarse grained quartzite, siltite, argillite, and carbonate and sandstone and undivided Belt Supergroup. The primary geomorphic processes in these landscapes are glacial, fluvial, and frost-churning.

Mean annual precipitation ranges from 20 to 30 inches (51 to 76 cm) varying by elevation. Most precipitation occurs in the spring, with about 15 percent falling as snow. The mean annual air temperature is 17.8 to 57.3 degrees F (-7.9 to 14.1 degrees C).

Streams in the valley bottoms are first through third order and occur from low to mid elevations. Wetlands are relatively numerous at the lower elevations associated with glacial outwash deposits. Small very shallow lakes are associated with these wetlands.

The primary natural disturbance processes are fire, insects, disease, flooding. Mass wasting is relatively uncommon. Human-caused disturbances include rural development, logging roads, mining, livestock grazing and large populations of wild ungulates out of range with their historical population.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms and wetlands; montane to subalpine forest; and alpine.

The valley bottoms are located on low to high elevation sites with dominant slope gradients from 0.5 to 15 percent. These landscapes include alluvial bottoms, glacial outwash terraces and glacial troughs in landforms that are formed in metasediment parent materials. The primary soils are deep sandy gravels, loamy sands, sands, silts, and organics. These soils are classified taxonomically as Typic Cryoborolls, Typic Cryochrepts, Typic Cryorthents, Histic Cryaquepts, and Fluvaquentic Cryofibrists. The dominant potential natural vegetation is the Douglas fir, spruce, subalpine fir series, the Geyer, planeleaf, and wolf willow, and the bluejoint reedgrass, tufted hairgrass and beaked sedge riparian series.

Montane to subalpine forests occur on mid elevation sites with dominant slope gradients of 20 to 35 percent. These landscapes include glaciated slopes, moraine, and frost-churned slopes and ridges in metasediment parent material. The primary soils are moderately deep to shallow gravelly and cobbly loamy sands. Taxonomically these soils are Typic Cryorthents, Typic Cryochrepts, Typic Cryoborolls, and Typic Cryoboralfs. The dominant potential natural vegetation is the Douglas fir, subalpine fir, whitebark pine series.

Alpine landscapes are at the higher elevations above treeline, with dominant slopes of 45 to 70%. Ridgetops and slopes prone to severe frost churning are mostly 10 to 20%. The alpine landscape is comprised of glacial headwalls, cirques, troughwalls, and glaciated slopes with varying amounts of till. These landforms are formed in Belt series rocks, mostly quartzites. The primary soils are shallow to very shallow, gravelly and channery to very

gravelly and channery Typic and Lithic Cryochrepts and Cryorthents. The dominant potential natural vegetation is subalpine fir/ whitebark pine krummholz, blackroot sedge, curly sedge/sheep cinquefoil, and Ross' avens/arctic sandwort communities.

Compiled By: D.J. Svoboda, Beaverhead National Forest

M332Eu Big Hole Valley

Location: This subsection is located in the Big Hole river basin of southwestern Montana.

Subsection Concept: This subsection consists of valley bottom river basin in Tertiary basin fill which has been modified by the uplifting of the surrounding mountains. The major vegetation cover types include willow, sedge, and sagebrush/grassland. This map unit is separated from siliarl basins by climate and vegetation.

Subsection Setting and General Characteristics: This basin has an elevation range of 6,000 to 7,120 feet (1,829 to 2,170 meters). The slope range is predominantly 3-10%. The dominant rock types are Oligocene through Pliocene basin fill composed of a heterogeneous mixture of gravel, sand, silt, and clay. The primary geomorphic process in these landscapes are fluvial.

Mean annual precipitation ranges from 14 to 20 inches (35.6 to 50.8 cm). Most precipitation occurs in the spring with about 10% falling as snow. The mean annual air temperature is 14.6 to 58.2 degrees F (-9.7 to 14.6 degrees C) at Wisdom.

The Big Hole river occurs in the valley bottom and there are wetlands associated with it up to a half mile from the river. The landscape includes some foothills but is only slightly dissected.

The primary natural disturbance processes are fire and flooding. Human caused disturbances include rural subdivision, logging roads, mining and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is the valley bottom.

The valley bottom is located on low elevation sites relative to the surrounding foothills and mountains. Dominant slope gradients are three to ten percent. This landscape includes fluvial landforms such as floodplian and terraces, and includes foothills and a low mountain adjacent to the Bitterroot Range (Beaverhead Mountains portion). These landforms are formed in basin fill materials, gravel, sand, silt and clay. The primary soils are deep silt loams, gravelly loams, and organics. Taxonomically these soils are Typic Cryochrepts, Argic Cryoborolls, Terric Cryofibrists, Typic Cryoborolls, Aquic Cryoborolls, and Cumulic Cryaqualls. The dominant potential natural vegetation is Douglas-fir and subalpine fir series, mountain big sage series, and coyote willow, Bebb's willow, Booth's willow, Geyers willow, and water sedge, beaked sedge communities.

Compiled By: Daniel Svoboda, Beaverhead National Forest

M332Ev Beaverhead Valley

Location: This subsection is located in the Beaverhead River basin of southwestern Montana.

Subsection Concept: This subsection consists of a fault valley landform of Tertiary sediments valley fill that have been modified by fluvial geomorphic processes. The major general vegetative type is sagebrush/grassland. This map unit is separated from similar subsections based upon climate and vegetative factors.

Subsection Setting and General Characteristics: This fault valley has an elevation range of 4,770 to 5,600 feet (1,454 to 1,707 meters). The dominant slope range is 0.5 to 8 percent. The dominant types of rocks are unconsolidated Quaternary alluvial and floodplain deposits containing clay to boulder-size material. The primary geomorphic process in these landscapes are fluvial.

Mean annual precipitation ranges from 9 to 14 inches/23 to 36 cms. Most precipitation occurs in the spring with less than ten percent of the precipitation falling as snow. The mean annual air temperature is 21.1/January to 66.2/July degrees F/ -6.1 to 19.00 degrees C.

The fifth order Beaverhead River is the dominant feature of this landscape. Sloughs and spring creeks are a significant character of the valley bottom associated with the river. Remnant wetlands occur; much of the wetland component has been converted to agricultural use.

The primary natural disturbance processes are fire and flooding. Human-caused disturbances include urban/suburban development, and agricultural development.

Subsection Ecological Relationships:

This subsection consists of a single primary landscape setting, a wide intermountain river valley bottom.

The Beaverhead valley is located on a relatively low elevation valley floor with dominant slope gradients from 0.5 to 8%. This landscape is formed in Quaternary aged alluvial deposits. The primary soils are Borollic Calciorthids*, Haplocalcitic Ustochrepts, Frigid Lithic Ustic Torriorthents, Frigid Ustic Torriorthents. The dominant potential natural vegetation are in the *Stipa comata*; *Agropyron spicatum*; *Festuca idahoensis*; *artemisia arbuscula*; *Artemisia tridentata*; and the *Sarcobatus vermiculatus* series.

* To be converted from Aridisol to another order in Montana

Compiled By: Beaverhead National Forest, Daniel Svoboda

M332Ew Madison Valley

Location: This subsection is located in the Madison river basin of southwestern Montana.

Subsection Concept: This subsection consists of a fault basin of Tertiary and Quaternary basin fill, stream, lake and glacial deposits modified by fluvial processes. The major vegetative types include shrub/grasslands. This map unit is separated from similar subsections based upon parent material or climatic/vegetative factors.

Subsection Setting and General Characteristics: This basin has an elevation range of 4,815 (Ennis Lake) to about 7,000 (Raynolds Pass) (1,468 to 2,134 meters). The dominant slope range is 4 to 15 percent. The dominant types of rocks are Quaternary and Tertiary (Oligocene through Pliocene) basin fill composed of cobble, gravel, sand, silt and clay deposited by glacial outwash and stream and lake deposits. The primary geomorphic processes are fluvial-alluvial.

Mean annual precipitation ranges 13.26 inches (33.68cm) at Ennis to about 20 inches (50.80cm) at Raynolds Pass. Most precipitation occurs April through September, with 5 to 10 percent of the precipitation falling as snow. The mean annual air temperature range is 23.4 to 65.3 (-4.8 to 18.5 degrees C).

The fifth order Madison river is the dominant feature of this landscape. Tributaries are a significant character of the valley bottom associated with this river. Cedar creek, a tributary originating in the Madison Range on the east side of the valley, has built the largest alluvial fan in the continental United States. Due to the coarse valley fill and agricultural development, there are few wetlands in this valley.

The primary natural disturbance processes are fire and flooding. Human caused disturbances include urban/suburban and rural development, agriculture, grazing, tourism and related development.

Subsection Ecological Relationships:

This subsection contains one primary landscape setting, the Madison river basin.

The basin is on low elevation sites but contains some foothills sites. Dominant slope gradients are from 1 to 10 percent. These landscapes include fluvial-alluvial landforms in valley fill parent materials. The primary soils are very shallow to moderately deep, gravelly and stony to very gravelly and stony on terraces; shallow to deep loams and sandy loams on the floodplain. These soils are classified taxonomically as Ustic Torrifuvents and Aquic Calciorthids*. The dominant potential natural vegetation is the needleandthread/blue gramma, big sage/bluebunch wheatgrass, and shrubby cinquefoil/Idaho fescue series.

*To be converted from Aridisol to another order in Montana.

Compiled By: D.J. Svoboda, Beaverhead N.F.

M332Ex Ruby/Tobacco Root Mountains

Location: This subsection is located in the Beaverhead, Ruby and Madison river basins in southwestern Montana.

Subsection Concept: This subsection consists of fault block mountains intersected by a valley bottom. The unit consists of Archean metamorphics, Cretaceous granitics, and Cambrian to Mississippian shale, sandstone and limestone bedrock that has been modified by glaciation, fluvial and colluvial processes. The major general vegetative types include coniferous forest, shrub/grasslands. This unit is separated from similar subsections based upon geologic structure and parent material.

Subsection Setting and General Characteristics: These block fault mountains and basin have an elevation range of 5,000 to 10,604 feet (1,524 to 3,232 meters). The dominant slope range is 30 to 65%. The unit is lithologically diverse. The dominant types of rocks are Archean high grade metamorphics consisting of gneiss, amphibolite, quartzite; Cretaceous quartz monzonite; Devonian and Cambrian consisting of Three Forks shale, Jefferson limestone, Park and Wolsey shale; Mississippian, Pennsylvanian and Permian rocks including Madison limestone and Quadrant sandstone; and Lower Mesozoic including Dinwoody and Thanes sandstone, shale, and limestone and Morrison shale and sandstone. The primary geomorphic processes in these landscapes are glacial, fluvial, colluvial, and pluvial.

Mean annual precipitation ranges from 13.29 at Alder in the valley bottom to more than 30 at the high elevations (33.75 to more than 76.2 cm). Most precipitation occurs May through September with about 15 falling as snow. The mean annual air temperature range is 22.1 to 62.9 degrees F (-5.5 to 17.2 degrees C) at Alder.

Streams typically occur in steep-sided narrow valley bottoms at mid and upper elevations. Third and fourth order streams occur in somewhat wider valley bottoms at the mid and lower elevations. The Ruby river, about a fifth order stream occupies a valley bottom averaging about three miles wide within the unit. The landscape is moderately to highly dissected. Wetlands occur in the larger valley bottoms, and also sometimes associated with the Morrison formation and finer textured alluvial deposits. Small natural lakes typically occur in cirque basins.

The primary natural disturbance processes are fire, insects, disease, flooding, mass-wasting. Human caused disturbance include mining, roading, logging, grazing, recreational use and development, rural subdivision.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include the valley bottoms, montane forests and grasslands, and alpine landscapes.

The valley bottoms are located on low to high elevation sites with dominant slope gradients from 0.5 to 15 percent. These landscapes include fluvial-alluvial bottoms, terraces and glacial troughs in granitics, gneiss, shale, limestone and sandstone parent materials. The primary soils are deep silt loams and gravelly loams. The dominant taxonomic subgroups are Ustic Torrifluvents, Aridic Argiborolls, Aquic Calciorthids. The dominant natural vegetation is the *Deschampsia cespitosa*/*Carex* series, the *Stipa comata*/*Bouteloua* and the *Artemisia tridentata*/*Agropyron spicatum* habitat types.

Montane forest and grasslands includes most of the foothills out of the valley bottoms, the montane slopes proper and the subalpine slopes and ridges. Dominant slope range is 20 to 50%. These landscapes include glacial till, colluvial slopes, and dissected pluvial landforms formed primarily in

limestone, sandstone, shale and gneiss. The primary soils are moderately deep silty clay loams, loams and flaggy sandy loams. The dominant taxonomic subgroups are Borollic calciorthids*; Carbonatic Typic Cryochrepts; Frigid Typic Ustochrepts; Typic, Lithic and Carbonatic Typic Cryochrepts; and Lithic and Typic Cryoborolls. The dominant potential natural vegetation is the Douglas fir series; the subalpine fir series; *Festuca idahoensis*/*Agropyron spicatum*; *Artemesia tridentata*/*Festuca idahoensis* habitat types.

The alpine landscapes are located on high elevation sites with dominant slopes ranging from 35 to 70%. Cirques and ridges have dominant slope range of 10 to 30%. This landscape has glacial cirques, headwall and troughwalls, glaciated slopes, frost-churned ridges and slopes and dissected residual slopes in mostly in limestone, gneiss and granitic parent materials. The primary soils are shallow to moderately deep sandy loams, gravelly and flaggy sandy loams. The dominant taxonomic subgroups are Typic Cryochrepts, Typic and Lithic Cryoborolls. The dominant potential natural vegetation is the subalpine fir, whitebark pine series; the *Deschampsia cespitosa*/*Carex* series; *Festuca idahoensis*/*Agropyron caninum* and *Artemesia tridentata*/*Festuca idahoensis* habitat types.

Compiled By: D.J. Svoboda, Beaverhead N.F.

M332Ey Gravelly and Snowcrest Ranges

Location: This subsection is located in the Ruby River Basin of southwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of Tertiary and Cretaceous sediments that have been modified by glaciation and mass-wasting. The major general vegetative types include coniferous forests, shrub/grasslands, and high elevation grassland. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 5,800 to 10,605 feet (1,768 to 3,232 meters). Two dozen peaks in the unit are over 9,000 feet (2,743 meters). The dominant slope range is 15-35%. The dominant types of rocks are Quaternary alluvial, till, outwash, morainal deposits, landslide deposits, and colluvial deposits; Tertiary lacustrine, volcanic and volcanoclastic rocks; Cretaceous shale, siltstone, and sandstone. The primary geomorphic processes are in these landscapes are mass-wasting, glacial, frost-churning, fluvial and colluvial.

Mean annual precipitation ranges from 14 to 30 inches (35.56 to 76.20 cm) depending on elevation. Most precipitation occurs April through September with less than 10 to about 15% falling as snow. The mean annual air temperature range is 22.1 to 62.9 degrees F (-5.5 to 17.2 C) at Alder, the nearest weather station.

There are a few small, shallow lakes. The west side of the Gravelly Range has mostly comparatively wide valley bottoms and moderate to low gradients (B,C,E stream types). On the east side of the range, valley bottoms are mostly narrow and steep (A,B stream types). The landscape is weakly to moderately dissected on the west side and moderately to highly dissected on the east side. Wetlands occur in valley bottoms associated with glacial and fluvial deposits. Wetlands, wet meadows and potholes occur in the uplands associated with Cretaceous shales that have weathered to clays. Glaciation and mass-wasting has created potholes in these deposits.

The primary natural disturbance processes are fire, insects, disease, mass-wasting, and flooding. Human-caused disturbances include grazing, roading, mining, and elk populations which have been allowed to greatly exceed their pre-european populations.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These are the valley bottoms; the montane grasslands and forests; and subalpine and alpine forests and meadows.

The valley bottoms are located from low to high elevation sites with dominant slope gradients from 0.5 to 15%. These landscapes include fluvial, glacial and mass-wasting landforms and terraces formed in Colorado Group shale, Madison limestone, Quadrant sandstone, Three-forks shale, and Tertiary and Quaternary volcanics, mostly rhyolite and pyroclastic rocks. The primary soils are deep clay loams and gravelly loams and sandy loams. The taxonomic subgroups are Typic Cryoborolls; Typic Cryochrepts; Typic Cryorthents; and Typic Cryaquolls. The dominant potential natural vegetation is *Salix bebbiana*; *Salix geyeriana*/*Carex utriculata*; *Salix wolfii*/*Carex aquatilis*; *Artemesia tridentata*/*Festuca idahoensis* habitat types.

Montane grasslands and forests are located on mid elevation slopes with dominant slope range of 15 to 45%. These landscapes include pediment slopes, mass-wasted slopes, colluvial and frost-churned slopes formed in mass-wasting, glacial till, and colluvial deposits, and the bedrock noted above. The primary

soils are deep silt loams, silty clay loams and clay. Taxonomic classifications are Typic Cryoborolls; Argic Cryoborolls; Typic Cryoboralfs; and Typic Paleboralfs. The dominant potential natural vegetation is subalpine fir series; spruce series; subalpine fir/whitebark pine series; Artemesia tridentata/Festuca idahoensis habitat type.

Subalpine and alpine landscapes are located on high elevation sites with dominant slope gradients of 10 to 30 percent. These landscapes include glacial, mass-wasting, nivational, structural, colluvial and frost-churned landforms in glacial till, mass-wasting deposits and bedrock noted earlier. The primary soils are moderately deep silt loams, loams, sandy loams, clay loams and gravelly loams. Taxonomic classifications are Typic and Aquic Cryochrepts; Typic, Lithic and Aquic Cryoborolls. The dominant potential natural vegetation is the subalpine fir and whitebark pine series; the Deschampsia cespitosa/ Carex spp. habitat type; the Festuca idahoensis/Potentilla diversifolia, Carex elinoides, Carex scirpoidea/Potentilla diversifolia, and Carex scopulorum/Caltha leptosepala habitat types.

Compiled By: Daniel Svoboda, Beaverhead National Forest

M332Ez Pahsimeroi/Round/Big Lost/Little Lost River Valleys

Location: This subsection is located in the Pahsimeroi Valley, Round Valley, Big Lost River and Little Lost River Valley Basins of Central Idaho.

Subsection Concept: This subsection consists of valley filled basin materials, fan terraces, foothills, glacial fan depositional lands and alluvial deposited flood plains of which is part of the grabens of southeast Idaho, Basin and Range. The material consists of Miocene- Recent lake bed and river deposits consisting of shales, sandstones, bentonite clays, conglomerates, Quaternary glacial outwash, alluvial fan and terrace material consisting of quartzite, volcanics and sedimentary rocks from adjacent mountain ranges. The major general vegetation types include grasslands, shrublands and deciduous trees. This map unit is separated from similar subsection to the north, east and west which is high elevation mountain ranges and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These valleys of depositional materials and low dissected foothills have an elevation range of 5,000 to 8,600 feet/1524 to 2637 meters. The dominate slope range is 0 to 65 percent. The dominant types of material consists of Miocene- Recent lake bed and river deposits consisting of shales, sandstones, Bentonite clays, conglomerates and quaternary glacial alluvial from adjacent mountain ranges. The primary geomorphic processes in these landscapes are fluvial, aeolian and mass wasting.

Mean annual precipitation ranges from 7 inches (18cm) at low elevation near Challis to 20 inches (51cm) at the higher elevations. Most precipitation occurs in the summer months. Thirty percent of the precipitation falls as snow. The mean annual temperature is from 34 F. to 48 degrees F. (1 to 9 degrees C).

Salmon River, Lemhi River, Pahsimeroi River, Big Lost River, Little Lost River and the following major creeks: Morgan, Morse, Trail, Doublespring, Williams, Badger, Deer, Wet, Squaw, Dry and Big Creeks occur within the area. The landscape ranges from slight to highly dissected. Wetlands occurs in valley bottom alluvial deposits.

The primary natural disturbance processes are fire and erosion. Human-caused disturbances include rural development, recreation, farming, fire, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include flood plains, foothills and fan terraces.

The flood plains formed in alluvium lands range from low to mid elevation sites with dominant slope gradients from 0 to 4 percent. This landscape includes slopes that are smooth or may be dissected by many small V and U-shaped drainages formed in alluvium from quartzite, limestone, dolomite and minor amounts of volcanics. The primary soils are moderately deep to very deep with textures of gravelly sandy loam, loam, clay loam, clay, silt loam and sand. Some areas are underlain with calcic horizons and have lime throughout the soil. Soils are classified as Cumulic Haplaquolls, Typic Cryaquolls, Calcic Cryaquolls, Cumulic Cryaquolls, Aquic Cryoborolls, Xerollic Calciorthisds and Camborthisds. The dominant potential natural vegetation at low to mid elevation is Wyoming big sagebrush, silver sagebrush, Idaho fescue, carex, willows, deschampsia, cottonwoods, western wheatgrass and inclusions of bluebunch wheatgrass.

The foothill lands are found at low to mid elevation sites with dominant side slope gradients from 8 to 65 percent. This landscape has low relief hills

that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Some areas are contain heavy clay and others have calcic horizons and have lime throughout the soil. These soils are classified as Argic Cryoborolls, Argic Lithic Cryoborolls, Argic Pachic Cryoborolls, Typic Cryoborolls, Calcic Cryoborolls, Calcic Pachic Cryoborolls, Pachic Cryoborolls, Calcic Argixerolls, and Xerollic Haplargids. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, Idaho fescue, willows, cottonwoods, bluebunch wheatgrass, western wheatgrass, aspens in draws and inclusions of curl-leaf mountain mahogany on the rocky hillsides.

The fan terrace lands are found at low to mid elevation sites with dominant side slope gradients from 1 to 20 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Some areas are underlain with calcic horizons and have lime throughout the soil while others contain duripans which interfere with root growth. These soils are classified as Typic Calciorthids, Xerollic Calciorthids, Typic Cryoborolls, Argic Cryoborolls, Duric Cryoborolls and Xerollic Durothids. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, Idaho fescue, willows, cottonwoods, bluebunch wheatgrass, western wheatgrass, aspens in draws and inclusions of Rocky mountain juniper.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Cliff Keene

M332Eaa Blacktail Range

Location: This subsection is located in the Beaverhead River Basin of southwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of Archean Metamorphic rocks; Tertiary volcanics and locally significant amounts of Mississippian sediments that have been modified by frost-churning, pluvial, and fluvial processes. The major general vegetative types include coniferous forest, grasslands, and shrublands. This map unit is separated from similar subsections based upon geologic structure and parent material.

Subsection Setting and General Characteristics: These block faulted mountains have an elevation range of 6,900 to 8,477 feet/2,103 to 2,584 meters. The dominant slope range is 20 to 70% percent. The dominant types of rocks are schist, gneiss, calc silicate rock, limestone, basalt and rhyolite. The primary geomorphic processes in these landscapes are glacial, fluvial, residual.

Mean annual precipitation ranges from 14 to 20 inches/ 36 to 51 cms. Most precipitation occurs in the spring with ten percent or less of the precipitation falling as snow. The mean annual air temperature is estimated to be below 29.7 to 56.1 degree F / -1.3 to 13.4 degrees C.

Streams typically occur in steep, narrow valley bottoms. The landscape is moderately to highly dissected. Wetlands occur typically occur in the valley bottoms associated with fluvial-alluvial deposits.

The primary natural disturbance processes are fire, insects, disease, windthrow, flooding, mass failures. Human-caused disturbances include logging, mining, ranching.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms and the uplands, including the limited higher elevation uplands.

The valley bottoms are located on low to mid elevation sites with dominant slope gradients from 2 to 12 percent. These landscapes include alluvial bottoms and glacial outwash that are formed in stratified fluvial deposits of cobbles, gravels, sands and silts. The primary soils are moderately deep to shallow loams, sandy loams, and gravelly sandy loams to loamy sands. These soils are classified as Carbonatic Calcic Cryoborolls, Carbonatic Typic Cryochrepts, Typic Cryoborolls, Typic Cryochrepts. The dominant potential natural vegetation is in the Douglas fir, willow, *deschampsia cespitosa*, and *Carex* types.

The uplands are located on mid to upper elevation sites with dominant slope gradients from 15 to 65%. These landscapes include colluvial slopes, glaciated slopes and frost-churned ridges. They are formed in Archean metamorphic schists, gneisses, limestones, and Tertiary volcanics parent materials. The primary soils are shallow to moderately deep loams, silt loams, and channery and gravelly loams. These soils are classified as as Typic Cryochrepts, Argic Cryoborolls, Typic Cryoborolls, Lithic Cryoborolls, Typic Cryoborolls, Carbonatic Calcic Cryoborolls. The dominant potential natural vegetation is Douglas fir, Juniper, Limber Pine, subalpine fir-whitebark pine series, and *Agropyron spicatum*, *Festuca idahoensis*, *Artemisia tridentata*, *Cercocarpus ledifolius* series.

Compiled By: Beaverhead National Forest, Daniel Svoboda

M332Ecc Red Rock Basin

Location: This subsection is located in the Red Rock River and Horse Prairie creek basins of southwestern Montana.

Subsection Concept: This subsection consists of a fault valley landform of Quaternary alluvial and floodplain deposits containing clay to boulder-size material, with some Tertiary volcanic and volcanoclastic rocks that have been modified by fluvial-alluvial processes. The major general vegetative types include riparian shrub, forest, and sagebrush/grassland. This map unit is separated from similar subsections based upon climatic/vegetative factors.

Subsection Setting and General Characteristics: This fault basin has an elevation range of 5,560 to 7,600 feet/1695 to 2316 meters. The dominant slope range is 0.5 to 4 percent. The dominant types of rocks are Quaternary valley fill deposits and Tertiary volcanics including basalt and rhyolite flows, welded and non-welded rhyolite and felsic tuffs and metagabbro dikes. The primary geomorphic process(es) in these landscapes are fluvial-alluvial.

Mean annual precipitation ranges from 10 to 20 inches/25 to 50 cms across the valley bottom. Most precipitation occurs in the spring with less than ten percent of the precipitation falling as snow. The mean annual air temperature is 21.1 to 49.0 degrees F/-6.1 to 9.4 degrees C.

Red Rock River, Horse Prairie Creek, Grasshopper Creek and Medicine Lodge Creeks occupy the valley bottom. The landscape is slightly dissected near the edges of the basin adjacent to the surrounding uplands. Wetlands occur in the bottom associated with the valley fill. Red Rocks Lakes occur in the upper east end; several large manmade lakes have been built in various places in the unit.

The primary natural disturbance processes are fire, flooding, and mass wasting.

Human-caused disturbances include urban/suburban development, rural development, ranching, farming, logging, mining, logging, and motorized recreation.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting, the valley bottom.

The valley bottom is located at relatively low elevation with dominant slope gradients from 0.5 to 10 percent. The landscape include fluvial-alluvial landforms that are formed in valley fill materials. The primary soils are shallow to deep loams, silt loams, gravelly loams and gravelly loamy sands. These soils are classified as Aquic Haploborolls; Frigid Typic Haploborolls; Borollic Calciorthids*; Carbonatic Borollic Calciorthids*; Aridic Calciborolls; Rock; Typic Cryoborolls; and Argic Cryoborolls. The dominant potential natural vegetation is the *Festuca idahoensis*, *Artemisia tridentata*, *Deschampsia cespitosa*, *Populus trichocarpa*; *Populus angustifolia*; *Salix bebbiana*; *Salix geyeriana* series.

* These are to be converted to another order in Montana. Most of these will likely be Ustochrepts.

Compiled By: Beaverhead National Forest, Daniel Svoboda

M332Edd Southern Beaverhead Mountains

Location: This subsection is located in the Red Rock river basin of the southwestern part of the state.

Subsection Concept: This subsection consists of block faulted mountains of Tertiary, Cretaceous, Mesozoic and Paleozoic sedimentary rocks; Precambrian metamorphics; volcanics; and Quaternary alluvium that have been modified by mountain glaciation and mass-wasting processes. The major general vegetative types include coniferous forest, grassland/shrubland and wetlands. This map unit is separated from similar subsections based upon geologic structure, lithology/soil parent material.

Subsection Setting and General Characteristics: These mountains have an elevation range of 7,000 to 10,196 feet (2,134 to 3,108 meters). The slope range is 2 to 75%. The dominant lithology is metamorphosed sedimentary rocks; Tertiary and Cretaceous sediments. The primary geomorphic processes in this unit are alpine glaciation, mass-wasting, and fluvial erosion and deposition.

Mean annual precipitation ranges from 20.36 inches (51.71cm) at Lakeview in the valley bottom, to about 40 inches (101.60) at the highest elevations. Most of the precipitation falls March through September; 10 to 20 percent occurs as snow, based on the Soil Conservation Services' April 1 snow water equivalent. The mean annual air temperature range is 11.4 to 58.6 degrees F (-11.4 to 14.8 degrees C) at Lakeview.

Streams and rivers typically occur on valley bottoms modified by alpine glaciation and mass-wasting. The landscape is typically weakly to moderately dissected, with second or third order streams occurring about every three-quarters to one and a quarter mile. First order tributaries to these occur about every quarter to half mile. Wetlands occur in areas of poorly drained soil, and in cirques, nivalational basins, and valley bottoms associated with alluvial deposits.

The primary natural disturbance processes are fire, insects, disease, and mass-wasting. Human caused disturbance includes recreational use and development, roads, tourism, mining, grazing, and limited logging.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, montane forest and grassland, and subalpine meadows, forests and alpine turf.

The valley bottoms are located on low to high elevation sites with dominant slope gradients from less than 2 to 15 percent. These landscapes include fluvial-alluvial bottoms in stratified deposits comprised largely of gravel and silts developed in metasediments, limestone, shales, and volcanic parent materials. The primary soils are deep silt loams and gravelly loams. Taxonomically, these soils are Pachic, Argic and Typic Cryoborolls. The dominant potential natural vegetation is Bebb's, Booths, and Geyer willow series; Spruce/equisetum; and Carex aquatilis communities.

Montane forest and grassland landscapes occur on mid elevation sites with dominant slope gradients from 15 to 40%. These landscapes include glaciated slopes, mass-wasted slopes, frost-churned, pluvial and colluvial slopes in metasediments, limestone, shales and volcanic parent materials. The primary soils are deep to very deep gravelly loams, silt loams and silty clay loams. Taxonomically they are Argic and Typic Cryoborolls. The dominant potential natural vegetation is the Douglas fir and subalpine fir series, and mountain big sage/Idaho fescue series.

The subalpine forests and meadows and alpine turf landscapes occur on the higher elevation sites with slope gradients of 20 to 65 percent. These

landscapes include cirques, troughwalls, glaciated slopes, mass-wasted slopes, and frost-churned slopes and ridges in metasediments, limestone, shale, and volcanic parent materials. The primary soils are shallow to deep gravelly loams, loams and silt loams. Taxonomically these soils are Typic, Argic Cryoborolls and Typic Cryorthents. The dominant potential natural vegetation is the subalpine/whitebark pine series; the tufted hairgrass/sedge series; and Tufted hairgrass/divers-leaved cinquefoil, and blackroot sedge communities.

Compiled By: D. J. Svoboda, Beaverhead N. F.

M332Eff Volcanic and Granitic Uplands

Location: This subsection is located in the Clark Fork river basin of southwestern Montana.

Subsection Concept: This subsection consists of block fault mountains of Cretaceous aged volcanics and intrusives; Tertiary volcanics; Upper Belt groups; and Cambrian to Devonian sediments that have been modified by glaciation and alluvial-colluvial processes. The major general vegetative types include coniferous forest and shrub/grassland. This map unit is separated from similar subsections based upon structure, parent material and climatic/vegetative factors.

Subsection Setting and General Characteristics: These block fault have an elevation range of about 5,500 to 8,400 feet (1,676 to 2,560 meters). The dominant slope range is 20 to 40 percent. The dominant types of rocks are Cretaceous volcanics consisting mostly of pyroclastics; younger Cretaceous rocks, mostly quartz monzonite; Tertiary volcanics, mostly rhyolite and pyroclastics; Cambrian to Devonian aged sediments, shale, limestone, and sandstone; Cretaceous Colorado Group shales; and Upper Belt series, Missoula Group quartzites. The primary geomorphic processes in these landscapes are glacial, colluvial and fluvial.

Mean annual precipitation ranges from 12.1 inches (30.7cm) at Butte to 30 inches (76.2cm) at the higher elevations. Most precipitation occurs during May through September with about 10 to 15% falling as snow. The mean annual air temperature is 39.1 degrees F (3.9 C) at Butte, with a range of 16.8 to 62.9 F (-8.4 to 17.2 C).

Streams typically occur in relatively steep, narrow valley bottoms at mid to high elevations, and broaden somewhat at low elevations. The landscape is moderately dissected. Wetlands occur in valley bottoms and sometimes in locations associated with sedimentary rocks.

The primary natural disturbance processes are fire, insects, disease, flooding, mass-wasting. Human-caused disturbances include urban and rural development, logging, mining, grazing, recreational use and development, roading and populations of wild ungulates much higher than historic levels.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include the valley bottoms, foothills and montane grasslands and forests, and the subalpine upper elevations.

The valley bottoms are located mainly at low and mid elevation sites with dominant slope gradients from .5 to 10 percent. These landscapes include fluvial and glacial deposit landforms and glacial troughbottoms in all parent materials noted above. The primary soils are moderately deep to deep silt loams to gravelly sandy loams. Taxonomic classifications include Typic and Aquic Cryoborolls, Typic Cryochrepts and Histic Cryaquepts. The dominant potential natural vegetation is the Douglas fir, Spruce and subalpine series; the *Populus angustifolia*/*Cornus stolonifera*; *Salix geyeriana*/*Carex utriculata* habitat types.

The foothills and montane grasslands and forested landscapes occur at lower and mid elevations with dominant slope gradient of 20 to 40 percent. These landscapes are predominantly glaciated slopes and pluvial landforms in all parent material noted above. The primary soils are moderately deep to deep silty clay loams and sandy loams. Taxonomic classifications include Typic Cryoboralfs, Typic Cryoborolls and Typic Cryochrepts. The dominant potential natural vegetation is the Douglas fir and subalpine series; and the *Festuca scabrella*/*Festuca idahoensis* habitat type.

The subalpine to alpine landscapes occur in the upper elevations with dominant slope gradients of 30 to 65 percent. These landscapes are predominantly glaciated slopes, glacial troughs and cirques, and frost-churned landforms in all the parent materials described above. The primary soils are shallow to moderately deep gravelly loams and sandy loams. Taxonomic classifications are Typic and Lithic Cryorthents and Cryochrepts. The dominant potential natural vegetation is the subalpine fir and whitebark pine series; the *Festuca scabrella*/*Festuca idahoensis*, habitat type; *Festuca idahoensis*/*Potentilla diversifolia*, and the *Carex elynoides* community types.

Compiled By: D.J.Svoboda, Beaverhead N.F.

M332Fa Pioneer Foothills

Location: This subsection is located in central Idaho, north of Carey Idaho. It includes the foothills along the front of the Pioneer Mountains.

Subsection Concept: This subsection consists of foothills and toeslopes of the Pioneer Mountains in central Idaho. These foothills and toeslopes formed from Missippian thrust shallow to deep marine detrital, Eocene mixed silicic and basaltic volcanic ejecta, flows and reworked debris, and metamorphosed granite intrusive rock. The major general vegetative types include sagebrush steppe through out this subsection. This map unit is separated from similar subsections based upon differences in geologic parent materials foothill geomorphology and influences from climatic/vegetative factors.

Subsection Setting and General Characteristics: These foothills and toeslopes have an elevation range of 5,000 to 7,800 feet/1,524 to 2,377 meters. The dominant slope range is 10 to 60 percent. The dominant types of rocks are basalt, sedimentary rock such as limestone and sandstone and granite. The primary geomorphic processes in these landscapes are volcanic and intrusive uplifts and faulting followed by fluvial process.

Mean annual precipitation ranges from 10 inches/254 mm at lowest elevations to 20 inches/508 mm at the highest elevations. Precipitation is evenly distributed throughout the fall winter and spring but low in the summer. The mean annual air temperature is 39 to 55 degrees F/4.0 to 13.0 degrees C.

The major streams that occur in this subsection are usually deeply entrenched and include the Snake River, and Wood River. Ground water is available in some areas. The landscape is moderately dissected.

The primary natural disturbance processes are fire. Fire occurred historically every 25 to 30 years on the sagebrush covertypes. Human-caused disturbances include grazing and mining.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include foothills and toeslopes.

The foothills are located on the highest elevation sites with dominant slope gradients from 15 to 60 percent. These landscapes include rolling hills and canyons that are formed from basalt, granite and sedimentary parent materials. The primary soils are shallow to very deep and well drained. Surface textures are generally loam. These soils are classified as Argic Cryoborolls, Pachic Argixerolls, Pachic Cryoborolls, and Entic Cryumbrepts associated with big sagebrush and bluebunch wheatgrass potential natural vegetation.

The toeslopes are located on lowest elevation sites with dominant slope gradients from 15 to 25 percent. These landscapes include footslopes and toeslopes that formed from basalt, granite and sedimentary parent material. The primary soils are shallow to very deep and well drained. Surface textures are sandy loam or loam. These soils are classified as Aridic Calcic Argixerolls, Argic Cryoborolls, Calcic Arigixerolls and Lithic Arigixerolls associated with big sagebrush and bluebunch wheatgrass potential natural vegetation.

Compiled By: Caribou National Forest

M332Fb Bald Mountain

Location: This subsection is located in the Big Wood River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountain range containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and alluvial lands. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite, sedimentary and volcanic. This area has been modified by fluvial, colluvial, frost churning and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north, east and west which is high elevation mountain ranges and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and alluvial lands have an elevation range of 5,500 to 10,336 feet/1677 to 3151 meters. The dominant slope range is 5 to 80 percent. The dominant types of rocks are granite, sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 17 inches (43cm) at low elevation to 45 inches (115cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 30 F. to 45 degrees F. (-1 to 8 degrees C).

Big Wood River, Prairie Creek, Baker Creek, Fox Creek, Adams Gulch, Warm Springs and Deer Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands and riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, old mining activities, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include steep canyonlands, mountain soils and alluvial lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 55 to 85 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in volcanic and sedimentary bedrock. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are moderately deep with textures of stony or rocky sandy loam and fine sandy loam. These soils are classified as Cryorthents, Haploxerolls, Xerorthents and Cryochrepts. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Idaho fescue and willows.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 80 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite, sedimentary and volcanic bedrock. Some areas include steep V-shaped drainages while others contain slumps. The

primary soils range from very shallow to deep with textures of stony, cobbly or rocky sandy loam, loam, loamy sand, sand and fine sandy loam. These soils are classified as Cryorthents, Cryochrepts, Cryopsamments, Cryoboralfs, Cryumbrepts, Cryoborolls, Argixerolls and Haploxerolls. Inclusions of Cryaquolls occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, bluebunch wheatgrass, mountain snowberry, Idaho fescue, antelope bitterbrush and arrowleaf balsamroot. The dominant potential natural forest vegetation at mid to high elevation wetter, sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica, mountain big sage, Idaho fescue, antelope bitterbrush, arrowleaf balsamroot and pinegrass. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows and aspen occur along riparian areas.

The alluvial lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 15 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite, sedimentary and volcanics. The primary soils are deep with textures of gravelly loam and sandy loam. These soils are classified as Cryoborolls, Cryorthents, Cryochrepts, Haploborolls and Cryaquolls. The dominant potential natural vegetation in shrublands is mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, antelope bitterbrush, lupine, arrowleaf balsamroot, willows and cottonwoods.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Falma Moye

M332Fc Pioneer Mountains

Location: This subsection is located in the Big Wood River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountain range which has been faulted and folded containing mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands, foothill lands and fan terraces. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite, metamorphics, sedimentary and volcanics. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include grasslands, shrublands and coniferous forests. This map unit is separated from similar subsection to the north and west which is high elevation mountain ranges, to the east, drier lands and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands have an elevation range of 5,000 to 12,000 feet/1524 to 3658 meters. The dominant slope range is 10 to 80 percent. The dominant types of rocks are granite, sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 20 inches (51cm) at low elevation to 50 inches (128cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 24 F. to 48 degrees F. (-4 to 9 degrees C).

East Fork Wood River, Little Wood River, Trail Creek, Baugh Creek and Muldoon Creek occur within the area. The landscape ranges from slight to highly dissected. Riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, old mining activities, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountain soils, foothills and fan terraces.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 80 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite and metamorphic bedrock. Some areas include steep V-shaped drainages while others contain slumps. The primary soils range from shallow to deep with textures of gravelly or rocky sandy loam, loam, silt loam and clay loam. These soils are classified as Cryorthents, Cryochrepts, Cryoborolls, Cryoboralfs and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, antelope bitterbrush and arrowleaf balsamroot. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica, mountain big sage, antelope bitterbrush, arrowleaf balsamroot and pinegrass. The highest elevations contain an alpine

zone with rock outcrop and rubbleland. Whitebark pine and limber pine occur in these areas. Willows and aspen occur along riparian areas.

The foothill lands are found at low to mid elevation sites with dominant side slope gradients from 30 to 70 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in sedimentary and volcanic bedrock. The primary soils are shallow to deep with textures of gravelly fine sandy loam. Some areas are underlain with calcic horizons and have lime throughout the soil. These soils are classified as Cryoboralfs, Haploxerolls, Cryoborolls, Argixerolls, Xerorthents and Cryaquolls in riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, bluebunch wheatgrass, mountain snowberry, antelope bitterbrush, arrowleaf balsamroot, Idaho fescue, aspen, willows and cottonwoods.

The fan terrace lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 55 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of sedimentary and volcanic bedrock. The primary soils are deep with textures of gravelly loam and sandy loam. Some areas are underlain with calcic horizons and have lime throughout the soil. These soils are classified as Cryoborolls, Cryorthents, Haploborolls and Cryaquolls in riparian areas. The dominant potential natural vegetation in shrublands is mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, aspen, willows and cottonwoods.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Falma Moye

M332Fd North Fork Big Lost River- Copper Basin- White Knob Mountains

Location: This subsection is located in the Big Lost River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountain range which has been faulted and folded mountains containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands, foothill lands and fan terraces. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite, sedimentary and volcanics. This area has been modified by fluvial, colluvial and mass wasting. The major general vegetation types include grasslands, shrublands and coniferous forests. This map unit is separated from similar subsection to the north and west which is high elevation mountain ranges, to the east, Basin and Range and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands, foothill lands and fan terraces have an elevation range of 6,000 to 12,000 feet/1829 to 3658 meters. The dominant slope range is 10 to 80 percent. The dominant types of rocks are sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 20 inches (51cm) at low elevation to 50 inches (128cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 24 F. to 43 degrees F. (-4 to 6 degrees C).

East Fork Salmon River, Big Lost River, East Fork Big Lost River, North Fork Big Lost River, East Pass Creek, Alder Creek, Antelope Creek, Star Hope Creek, Wildhorse Creek and Summit Creek occur within the area. The landscape ranges from slight to highly dissected. Riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, old mining activities, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings. These include steep canyonlands, mountain soils, foothills and fan terraces.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in sedimentary and volcanic bedrock. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are shallow to moderately deep with textures of gravelly sandy loam and fine sandy loam. These soils are classified as Xerorthents and Haploxerolls. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Idaho fescue and willows.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 80 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge

tops) and were formed in granite, sedimentary and volcanic bedrock. Some areas include steep V-shaped drainages while others contain slumps. The primary soils range from very shallow to deep with textures of stony or rocky sandy loam, loamy sand and sand. These soils are classified as Cryorthents, Cryochrepts, Cryopsamments, Cryumbrepts, Cryoboralfs, Cryaquolls, Haploxerolls and Sphagnofibrists in wet meadows. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, aspen, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows occur along riparian areas.

The foothill lands are found at low to mid elevation sites with dominant side slope gradients from 20 to 60 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in sedimentary and volcanic bedrock. The primary soils are shallow to deep with textures of gravelly loam, sandy loam and fine sandy loam. Some areas are underlain with calcic horizons and have lime throughout the soil. These soils are classified as Argic Cryoborolls, Argic Lithic Cryoborolls, Argic Pachic Cryoborolls, Calcic Argixerolls, Ultic Argixerolls, Xerollic Haplargids, Argiborolls, Haploxerolls, Xerorthents and Cryaquolls in riparian areas. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows, aspen, cottonwoods and inclusions of curl-leaf mountain mahogany on the rocky hillsides.

The fan terrace and alluvial lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 55 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite, sedimentary and volcanics. The primary soils are moderately deep to deep with textures of gravelly or cobbly loam and sandy loam. Some areas are underlain with calcic horizons and have lime throughout the soil. These soils are classified as Cryoborolls, Calciorthidic Haploxerolls, Fluventic Haploxerolls, Cumulic Cryaquolls, Cryorthents, Haploborolls and Cryochrepts. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows, cottonwoods and inclusions of Rocky mountain juniper.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Steven Spencer

M332Fe Boulder Mountains

Location: This subsection is located in the Big Wood River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountains containing steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite, sedimentary and volcanics. This area has been modified by fluvial, colluvial and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north, east and west which is high elevation mountain ranges and to the south is the Snake River Plains.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands have an elevation range of 6,000 to 11,112 feet/1829 to 3388 meters. The dominant slope range is 0 to 90 percent. The dominant types of rocks are granite, sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 15 inches (38cm) at low elevation to 50 inches (128cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 27 F. to 43 degrees F. (-3 to 6 degrees C).

East Fork Salmon River, Big Wood River, North Fork Wood River, East Fork Wood River and West Fork Wood River occur within the area. The landscape ranges from slight to highly dissected. Riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, fire, old mining activities, livestock grazing, erosion and paved and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include steep canyonlands, mountain soils and fan terraces.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 55 to 85 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite, volcanic and sedimentary bedrock. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are shallow to moderately deep with textures of stony or rocky sandy loam and fine sandy loam. These soils are classified as Cryorthents and Cryochrepts. The dominant potential natural vegetation in shrublands at low to mid elevation is mountain big sagebrush, Idaho fescue and willows.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 90 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite, sedimentary and volcanics bedrock. Some

areas include steep V-shaped drainages while others contain slumps. The primary soils range from very shallow to deep with textures of stony, cobbly or rocky loam, sandy loam, loamy sand, fine sandy loam and sand. These soils are classified as Cryorthents, Cryochrepts, Cryoborolls, Cryopsamments, Cryoboralfs, Haploxerolls and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows and aspen occur along riparian areas.

The fan terrace and alluvial bottom lands are found at low to mid elevation sites with dominant side slope gradients from 0 to 15 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of granite, sedimentary and volcanics. The primary soils are deep with textures of gravelly loam and sandy loam. These soils are classified as Cryoborolls, Cryorthents, Cryochrepts, Cryaquolls and Haploborolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows and cottonwoods.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Falma Moye, and Sawtooth National Forest; Deb Bumpus

M332Fg Upper Middle Fork Salmon River Mountains

Location: This subsection is located in the Middle Fork of the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of streamcut mountain and canyonlands consisting of steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands. The bedrock consists of granite, quartz monzonite, volcanic and minor amounts of sedimentary bedrock. This area is part of the Trans Challis Fault System and includes the Castro Pluton, Custer graben, Panther Creek graben, Twin Peaks and Van Horn Caulderas. This area has been modified by fluvial, colluvial, frost churning and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north which contain dissected faulted uplands, anticline to the east, rejuvenated granite glaciated mountain ridge system on the west and uplifted strongly glaciated ridge system on the south.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands have an elevation range of 5,000 to 9,000 feet/1524 to 2744 meters. The dominate slope range is 35 to 70 percent. The dominant types of rocks are granite, quartz monzonite, volcanics and minor amounts of sedimentary bedrock. The primary geomorphic processes in these landscapes are fluvial, colluvial, frost churning and mass wasting.

Mean annual precipitation ranges from 25 inches (64cm) in the canyon bottoms to 35 inches (89cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 33 F. to 48 degrees F. (0.6 to 9 degrees C).

Salmon River, Middle Fork of the Salmon River, Camas Creek, Loon Creek, Mayfield Creek, Yankee Fork Creek and Jordon Creek occur within the area. The landscape ranges from slight to highly dissected with glacial-fluvial and alluvial deposits. Numerous high elevation lakes occur in cirque basins.

The primary natural disturbance processes are fire, erosion, insects and disease. Human-caused disturbances include rural development, many old mining activities, numerous small active mines and one large active open pit mine, fire, forest management, recreation, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of six primary landscape settings. These include steep canyonlands, mountain slopelands, cryic uplands, cryic basinlands, glacial troughlands and strongly glaciated lands.

The steep canyonlands range from low to mid elevation sites with dominant slope gradients from 60 to 90 percent. This landscape includes steep, rocky V-shaped canyons, rocky ridges and narrow side canyons that are formed in granite, quartzite monzonite, volcanics and minor inclusions of argillite. Inclusions of wide alluvial bottoms along major creeks consists of terraces and floodplains. The primary soils are shallow to deep with textures of gravelly or rocky sandy loams, loamy sands and loam. These soils are classified as Haploxerolls, Cryorthents, Cryoborolls and Cryochrepts. The dominant potential natural vegetation in shrublands at mid elevation is threetip sagebrush, mountain big sagebrush, Idaho fescue and willows. The dominant potential natural forest vegetation at mid elevation is Douglas-fir, elk sedge, pinegrass, bluebunch wheatgrass, Idaho fescue and curl-leaf mountain mahogany. Willows occur along riparian areas.

The mountain slopelands range from low to high elevation sites with dominant slope gradients from 40 to 65 percent. This landscape includes slopes that are smooth or may be dissected by many V-shaped drainages formed in granite, quartzite monzonite, volcanics and minor inclusions of argillite. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams, loamy sands, silt loams, clay loams and loams. These soils are classified as Cryorthents, Cryochrepts, Haploxerolls, Cryoborolls, Cryoboralfs, Argixerolls, Haploxeralfs and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at mid elevation is threetip sagebrush, mountain big sagebrush and Idaho fescue. The dominant potential natural forest vegetation at mid elevation is Douglas-fir, elk sedge, pinegrass, bluebunch wheatgrass, Idaho fescue and curl-leaf mountain mahogany. Willow occur along riparian areas.

The cryic uplands range from mid to high elevation sites with dominant slope gradients from 15 to 50 percent. This landscape includes broad, gently sloping ridge tops and mountain slopes at high elevations that are formed in granite, quartz monzonite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky sandy loams and loams. These soils are classified as Cryorthents, Cryoborolls, and Cryochrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation is subalpine fir, grouse whortleberry, heartleaf arnica, elk sedge and pinegrass at mid to high elevations. Willows are found along riparian areas.

The cryic basinlands range from mid to high elevation sites with dominant slope gradients from 30 to 60 percent. This landscape is subdued and the ridgetops are rounded that have been modified by frost action and drainage waters of glaciers that were formed in volcanics. The primary soils are shallow to deep with textures of gravelly or rocky sandy loams, loams, clay loams and silt loams. These soils are classified as Cryorthents, Cryochrepts, Cryoborolls and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, subalpine fir, elk sedge, pinegrass, bluebunch wheatgrass, Idaho fescue, curl-leaf mountain mahogany, grouse whortleberry and heartleaf arnica. Willows are found along riparian areas.

The glacial troughlands range from mid to high elevation sites with dominant side slope gradients from 50 to 75 percent and 10 to 25 percent in the bottoms. This landscape includes U-shaped valleys that have been carved and shaped by moving valley glaciers and are formed in granite, quartz monzonite and volcanics. The primary soils are moderately deep to deep with textures of gravelly or rocky loam, sandy clay loam and sandy loams. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts, Cryochrepts and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, subalpine fir, elk sedge, pinegrass, bluebunch wheatgrass, Idaho fescue, curl-leaf mountain mahogany, grouse whortleberry and heartleaf arnica. The highest elevations contain alpine zone with rock outcrop and rubble land. Willows are found along riparian areas.

The strongly glaciated lands are found at mid to high elevation sites with dominant side slope gradients from 60 to 90 percent and 10 to 25 percent in the cirque basins. This landscape has been strongly modified by alpine glaciation and includes cirques, cirque basins, headwalls, high peaks and ridge tops that were formed in granite, quartz monzonite and volcanics. The primary soils are shallow to deep with textures of gravelly or rocky loam, sandy clay loam and sandy loam. These soils are classified as Cryorthents, Cryoborolls, Cryumbrepts, Cryochrepts and Cryoboralfs. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural forest vegetation at mid to high elevation is Douglas-fir, subalpine fir, elk sedge, pinegrass, bluebunch wheatgrass, Idaho fescue, curl-leaf mountain mahogany, grouse whortleberry and heartleaf arnica. The

highest elevations contain alpine zone with rock outcrop and rubbleland.
Willows are found along riparian areas.

Compiled By: Salmon-Challis National Forest; Gary Jackson/Cliff Keene

M332Fh East Fork Salmon River Mountains

Location: This subsection is located in the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted mountain range which is part of the Bayhorse anticline containing mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of sedimentary quartzite, dolomite, limestone, sandstone, phyllite, slate and volcanic tuff, lava and rhyolites. This area has been modified by fluvial, colluvial and mass wasting. The major general vegetation types include grasslands, shrublands, deciduous trees and coniferous forests. This map unit is separated from similar subsection to the north and west which is high elevation mountain ranges, to the east, Basin and Range and to the south is faulted, folded mountains.

Subsection Setting and General Characteristics: These steep canyonlands, mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and foothill lands have an elevation range of 5,200 to 10,313 feet/1585 to 3144 meters. The dominate slope range is 20 to 75 percent. The dominant types of rocks are sedimentary and volcanics. The primary geomorphic processes in these landscapes are fluvial, colluvial and mass wasting.

Mean annual precipitation ranges from 7 inches (18cm) at low elevation near Challis to 40 inches (102cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 34 F. to 48 degrees F. (-1 to 7 degrees C).

Salmon River, East Fork Salmon River, Morgan Creek, Challis Creek, Garden Creek, Bayhorse Creek, Kinnikinic Creek, Squaw Creek, Big Lake Creek, Big Boulder Creek, Pine Creek, Herd Creek, Road Creek and Spud Creek occur within the area. The landscape ranges from slight to highly dissected. Wetlands occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include rural development, recreation, farming, fire, many old mining activities, one large open pit mine in production, livestock grazing, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include mountain soils, foothills and fan terraces.

The mountain soils range from low to high elevation sites with dominant slope gradients from 20 to 75 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in sedimentary and volcanics bedrock. Some areas include steep V-shaped drainages while others contain slumps. The primary soils range from shallow to deep with textures of gravelly or rocky sandy loams, loam, silt loam and clay loams. These soils are classified as Cryorthents, Dystric Cryochrepts, Argic Cryoborolls, Calcic Cryoborolls and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The dominant potential natural vegetation in shrublands at low to mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest

vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest elevations contain an alpine zone with rock outcrop and rubbleland. Willows occur along riparian areas.

The foothill lands are found at low to mid elevation sites with dominant side slope gradients from 8 to 65 percent. This landscape has low relief hills that have been formed on old erosion surface with well rounded ridges and V and U-shaped valleys that were formed in quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Some areas are underlain with calcic horizons and have lime throughout the soil while others contain duripans which interfere with root growth. These soils are classified as Argic Cryoborolls, Argic Lithic Cryoborolls, Cryoboralfs, Calcic Argixerolls, Xerollic Haplargids, Xerollic Calciorthids, Xerollic Durothids and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows, cottonwoods and inclusions of curl-leaf mountain mahogany on the rocky hillsides.

The fan terrace lands are found at low to mid elevation sites with dominant side slope gradients from 1 to 20 percent. This landscape has benches, glacial fan depositional lands and alluvial deposited fan terraces that have been formed on old erosion surface with nearly level surfaces and with V and U-shaped valleys that were formed from parent material of quartzite, limestone, dolomite and volcanics. The primary soils are shallow to deep with textures of gravelly loam, sandy loams, clay loams, sandy clay loams, clay, silty clay, silt loam and silty clay loam. Some areas are underlain with calcic horizons and have lime throughout the soil while others contain duripans which interfere with root growth. These soils are classified as Xerollic Calciorthids, Xerollic Camborthids, Calcic Cryoborolls, Calcic Argixerolls, Xerollic Durothids and Cryaquolls. The dominant potential natural vegetation in shrublands is silver sagebrush, mountain big sagebrush, black sagebrush, bluebunch wheatgrass, western wheatgrass, Idaho fescue, willows, cottonwoods and inclusions of Rocky mountain juniper.

Compiled By: Salmon-Challis National Forests; Gary Jackson/Cliff Keene

M332Fi Profile Peak - Monumental Summit Mountains

Location: This subsection occurs on glaciated and unglaciated mountain ranges in central Idaho. The area contains the Upper East Fork of the South Fork of the Salmon River and the southern boundary is just north of the Lower Middle Fork of the Salmon River.

Subsection Concept: This subsection consists of glaciated mountain peaks and trough valleys, frost churned uplands, and steep volcanic fluvial lands formed by stream rejuvenation processes. Potential natural vegetation is dominated by subalpine fir communities on high-elevation glaciated landscapes and mixed conifer (Douglas fir series) on warm aspects of fluvial lands. This map unit is separated from similar subsections based upon differences in bedrock lithology.

Subsection Setting and General Characteristics: These rugged mountain ranges have an average elevation range of 3800 to 9450 feet (~ 1160 to 2620 meters); Median elevation is about 7000 feet (~ 2130 meters). Dominant local relief ranges from 2000 to 3500 feet (~ 610 to 1070 meters). Slope gradient ranges from 20 to 80 percent, dominantly 40 to 80 percent. The dominant lithology is Challis Volcanic rocks (e.g., andesite, rhyolite, tuffs) with some granitics and Precambrian quartzite in the western portion of the unit. The primary geomorphic processes in these landscapes are uplift and glaciation followed by stream rejuvenation and mass wasting.

Mean annual precipitation ranges from 20 inches (~ 50 centimeters) in the fluvial mountains to 45 inches (~ 114 centimeters) in the glaciated mountains and uplands. Higher elevations may receive up to 50 inches (127 centimeters) in localized areas. Large variations occur across this subsection because of the wide range in elevation. Most precipitation occurs during October through April. At mid to upper elevations above 4500 feet, 85 percent of the precipitation falls as snow. Winter rain is common in December and January at elevations below 4500 feet. Mean annual air temperature is 23 to 45 degrees F (~ minus 5 to plus 7 degrees Centigrade).

The landscape is moderately to highly dissected with perennial streams, including Big Creek, Marble Creek, Monumental Creek, Indian Creek, and the Upper East Fork of the South Fork of the Salmon River. Wet meadows and riparian reaches with high water tables occur on low-gradient depositional landforms. Small lakes occur in glacial cirque basins at high elevations.

The primary natural disturbance regimes include wildfire, insect and disease epidemics, fluvial erosion, and mass wasting processes. The glaciated lands are subject to high runoff from intense storms, but most remain relatively stable due to high percentages of surface rock fragments. Deep snows and steep slopes contribute to the high avalanche hazard of glaciated landforms. Debris slides occur in some of the steeper drainages of the lower-elevation fluvial mountains. Slump earthflows occurred historically along geological contact zones and areas of extreme downcutting by fluvial processes. Sediment produced from management access and development is high, and valley bottoms are subject to periodic flooding. Human-caused disturbances include mining activities, timber harvest, and recreation development. Much of this subsection is located in the Idaho Primitive Area where unnatural disturbances are only related to recreation trail systems.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings; 1) Glaciated Mountains and Uplands (about 50 percent of area), 2) Periglacial (Frost Churned) Uplands (about 20 percent of area), 3) Fluvial Mountains (about 20 percent of area), and 4) Depositional Lands (about 10 percent of area).

The Glaciated Mountains and Uplands are characterized by high-elevation mountain peaks with average slopes of 40 to 80 percent, glacial trough

sideslopes of 30 to 60 percent, and ice-scoured cirque basins with moderate slopes of 10 to 40 percent. Elevation ranges from approximately 6000 to 9500 feet (~ 1830 to 2900 meters).

Periglacial Uplands (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation ranges from approximately 5500 to 7500 feet (~ 1680 to 2290 meters).

Fluvial Mountains (30 to 80 percent gradient) are characterized by steep dissected mountain slopes with V-shaped drainages at low to mid elevations of 3800 to 6500 feet (~ 1160 to 1980 meters).

Depositional lands consist of moraines, outwash plains and alluvial landforms that have nearly level to moderately sloping gradients of 0 to 20 percent. Elevation ranges from 3800 to 7000 feet (~ 1160 to 2130 meters).

Dominant soils are shallow to moderately deep on glacially scoured lands and fluvial lands, and soil textures consist of sands, loamy sands, and sandy loams. Moderately deep and deep soils are associated with lower slopes of glacial troughs, valley bottoms and other depositional landscape positions. Soil textures in these areas consist of loams and sandy loams. Soils are classified as Typic and Lithic Xerorthents and Xeropsamments, and Entic Ultic and Lithic Ultic Haploxerolls on low-elevation fluvial lands with dry aspects. Typic and Lithic Cryorthents, Cryopsamments, Cryochrepts, Cryumbrepts, and weakly developed Cryoboralfs are found on cool sites at mid to upper elevations. Lithic subgroups are associated with glacially scoured areas near exposed bedrock. Cryaquepts and Cryaquolls are associated with poorly drained soils and high water tables.

Potential natural vegetation is dominated by the subalpine fir series. Sparse stands of subalpine fir/whitebark pine occur at the upper elevations. Relatively dense stands of Englemann spruce and seral lodgepole pine occur on moderately sloping lands such as cirque basins and valley bottoms. Douglas fir generally occurs below 6000 feet on warmer aspects. Minor areas of Ponderosa pine and shrub/grass communities occur at low elevations on dry aspects of Canyonlands. Riparian community types are associated with poorly drained soils and high water tables in lowland positions.

Compiled By: Payette National Forest; R. Jorgensen

M332Ft White Cloud Peaks

Location: This subsection is located in the Salmon River and the East Fork of the Salmon River Basin of Central Idaho.

Subsection Concept: This subsection consists of uplifted, strong alpine glaciated mountains containing mountain slopelands, cryic uplands, glacial troughlands and strongly glaciated lands. Also included are valleys filled with basin materials, fan terraces, glacial fan depositional lands and alluvial deposited flood plains. The bedrock consists of granite and minor amounts of sedimentary. This area has been modified by fluvial, colluvial and frost churning. The major general vegetation types include shrublands, alpine vegetation and coniferous forests. This map unit is separated from similar subsection to the north, east, south and west which is lower elevation mountain ranges.

Subsection Setting and General Characteristics: These mountain slopelands, cryic uplands, glacial troughlands, strongly glaciated lands and fan terraces have an elevation range of 7,000 to 11,815 feet/2134 to 3602 meters. The dominant slope range is 10 to 80 percent. The dominant types of rocks are granite and sedimentary. The primary geomorphic processes in these landscapes are fluvial, colluvial and frost churning.

Mean annual precipitation ranges from 30 inches (77cm) at low elevation to 50 inches (128cm) at the higher elevations. Most precipitation occurs in the winter and spring months. Sixty five percent of the precipitation falls as snow. The mean annual temperature is from 24 F. to 40 degrees F. (-4 to 4 degrees C).

East Fork Salmon River, Germania Creek, Jim Creek, Slate Creek, Warm Springs Creek, Fourth of July Creek and Champion Creek occur within the area. The landscape ranges from slight to highly dissected. Riparian areas occur in valley bottom locations associated with glacial-fluvial and alluvial deposits and many lakes occur in the high elevation cirques.

The primary natural disturbance processes are fire, insect, disease and erosion. Human-caused disturbances include recreation, old mining activities, livestock grazing, fire, erosion and dirt roads.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. These include mountain soils.

The mountain soils range from low to high elevation sites with dominant slope gradients from 5 to 80 percent. This landscape includes mountain slopelands (slopes that vary from smooth to highly dissected), cryic uplands (broad, gently sloping ridge tops and mountain slopes at high elevations), glacial troughlands (U-shaped valleys that have been carved and shaped by moving valley glaciers) and strongly glaciated lands (strongly modified by alpine glaciation and include cirques, cirque basins, headwalls, high peaks and ridge tops) and were formed in granite and sedimentary bedrock. The primary soils range from very shallow to deep with textures of stony, cobbly or rocky sandy loam, loamy sand and sand. These soils are classified as Cryorthents, Cryochrepts, Cryopsamments and Cryumbrepts. Inclusions of Cryaquolls and Sphagnofibrists occur in the wet riparian areas. The alluvial bottom lands contain deep loam and sandy loam textures. The soils are classified as Cryoborolls, Cryorthents and Cryochrepts. The dominant potential natural vegetation in shrublands at mid elevation is Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass and Idaho fescue. The dominant potential natural forest vegetation at mid to high elevation wetter sites is Douglas-fir, subalpine fir, elk sedge, mountain snowberry, heartleaf arnica and pinegrass. The highest elevations contain an alpine zone with inclusions of whitebark pine occurring in rock outcrop and rubbleland. Willows and aspen

occur along riparian areas.

Compiled By: Salmon-Challis National Forests; Gary Jackson, and Sawtooth
National Forest; Deb Bumpus

M332Ga Minam-Tollgate Plateau

Location: This subsection of the Blue Mountains Section is located on the uplands lying north and west of the Grande Ronde River and on uplands flanking the Wallowa Mountain highlands in northeastern Oregon and southeastern Washington.

Subsection Concept: This subsection consists of dissected, basalt plateau uplands with cool and usually moist soils with a volcanic ash mantle. The major general vegetative type is a moist, productive coniferous forest which occurs in a moist, marine-influenced climate. This map unit is separated from adjacent subsections based upon climate and topographic position. This subsection is at lower elevation than the cold highlands of the Wallowa-Elkhorn Mountains subsection (M332Gk). This subsection is differentiated from other intermediate-elevation, forested subsections by the flow of moist marine air and summer convection storms that build against the Wallowa Mountain highlands to provide cool, more humid air and greater precipitation. This moisture and greater water holding capacity of the volcanic ash mantle provide usually moist soil conditions throughout the growing season.

Subsection Setting and General Characteristics: These dissected basalt plateaus have an elevation range of 4,000 to 6,500 feet (1,300 to 2,100 meters). The dominant slope range is 15 to 60 percent. The dominant type of rocks are Columbia River basalts. The primary geomorphic processes in these landscapes are wind and water erosion.

Mean annual precipitation ranges from 20 to 40 inches (50 to 100 cm). Precipitation occurs mostly as snow with spring and fall rains. The mean annual air temperature is 36 to 45 degrees F (2 to 7 degrees C).

The primary natural disturbance process is fire. Human-caused disturbances are associated with timber harvesting, recreation, fire-suppression and grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the basalt plateau upland.

These basalt plateaus are located on mid-elevation sites with dominant slope gradients of 15 to 60 percent. Most soils in this subsection are cool (frigid), usually moist (udic) and have a thick mantle of volcanic ash without a clay-enriched subsoil (Typic Udivitrands), or with a clay-enriched subsoil (Alfic Udivitrands, Andic or Vitrandic Eutroboralfs). Included are soils on south-facing slopes, with less volcanic ash, or in runoff (convex) slope positions that are dry for 45 days or more in late summer months (Typic Vitrixerands, Vitrandic Xerochrepts), with clay-enriched subsoil (Vitrandic Haploxeralfs) or dark, organic matter-rich surface layer (Vitrandic Haploxerolls). Plant associations of the Grand Fir (*Abies grandis*) series are dominate on the usually moist soils in this subsection. Lodgepole pine (*Pinus contorta*), Ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*) and Douglas fir (*Pseudotsuga menziesii*) are the principal seral tree species. Engelmann spruce (*Picea engelmannii*) may codominate with grand fir in late seral stands on moist sites. Understory species are Queen's cup beadlily (*Clitonia uniflora*), twinflower (*Linnaea borealis*), big huckleberry (*Vaccinium membranaceum*), and grouse huckleberry (*Vaccinium scoparium*). On the drier sites, Grand fir or Douglas fir plant associations, with spiraea (*Spiraea betulifolia*), common snowberry (*Symphoricarpos albus*) or elk sedge (*Carex geyeri*) as key understory species, predominate.

Compiled by: Duane Lammers, U.S. Forest Service

M332Gb Drewsey-Hampton Foothills

Location: This subsection is located in southern Crook, northern Harney and northwestern Malheur Counties, Oregon.

Subsection Concept: This subsection consists of the moderately dissected foothills of the Maury Mountains and Strawberry Mountains portions of the Blue Mountains. These foothills are underlain by a mix of igneous extrusive rocks and pyroclastic materials. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon vegetation, landform, topography and climate. The adjacent Ochoco-Strawberry Basalts subsection is forested. The High Desert Lake Basins subsection is characterized by flood plains and terraces. The Low Steens Mountain subsection is characterized by a nearly level to gently sloping basalt plateau. The Owyhee Foothills subsection has a warmer climate.

Subsection Setting and General Characteristics: These foothills have a dominant elevation range of 4500 to 5500 feet (1372 to 1676 meters). There are a few isolated peaks ranging up to 7500 feet. The dominant slope range is 5 to 50 percent. The dominant types of bedrock are mixed andesite, basalt, rhyodacite ash flow, tuffs and silicic ash flow tuffs. The primary geomorphic process in these landscapes is erosional. Sheet and rill erosion leads to overloaded streams and deposition in intermountain drainages.

Mean annual precipitation generally ranges from 10 inches (25 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains and occasional summer thunderstorms. The mean annual air temperature is 43 to 50 degrees F (6 to 10 degrees C).

There are numerous ephemeral streams and some perennial streams and rivers, including the Malheur River, Silvies River and the West Fork of Camp Creek.

The primary natural disturbance process is fire. The main human-caused disturbances are livestock grazing and mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the foothills.

These foothills are located on mid-elevation sites with dominant slope gradients from 5 to 50 percent. These landscapes include the foothills and associated drainageways which have formed in material weathered from a mix of igneous extrusive rocks. The soil moisture regime is typically xeric with a frigid soil temperature regime. East of the town of Drewsey, the soil moisture regime is aridic with mesic and frigid soil temperature regimes. The primary soils are moderately deep and shallow to bedrock. The surface layer is typically very stony loam with a very gravelly or gravelly clay loam subsoil. In the area north of Hampton and west of Drewsey, Typic Argixerolls, Pachic Haploxerolls, Lithic Argixerolls, Pachic Argixerolls, and Lithic Haploxerolls dominate the landscape. In the area east of Drewsey, Aridic Argixerolls, Xeric Haplocambids, Aridic Palexerolls, Xeric Haplargids and Torriorthents dominate the landscape. The soils along the riparian areas consist of Cumulic Haploxerolls, Cumulic Endoaquolls and in Silvies Valley, Cumulic Cryaquolls. The dominant potential natural vegetation consists of mountain big sagebrush, western juniper, Wyoming big sagebrush, Idaho fescue, bluebunch wheatgrass and Sandberg bluegrass. The wet riparian areas have willows, sedges and rushes.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Carrie Gordon and Joe Bailey, U. S. Forest Service

M332Gd Snake River Canyon

Location: This subsection is located in the lower Snake and Salmon River basins in north central Idaho and eastern Oregon.

Subsection Concept: This subsection consists of glaciated and unglaciated mountains, dissected and downcut, in a zone of transition from canyon to montane climatic influence. Major bedrock lithology is Tertiary basic igneous and Permian and Triassic metamorphic rock. Bunchgrass, dry, mesic and subalpine forests dominate the landscape. This map unit is separated from similar subsections based upon bedrock lithology.

Subsection Setting and General Characteristics: These mountains and canyon lands have an elevation range of 1000 to 8500 feet (300 to 2550 m). The slope range is 1 to more than 100 percent. The dominant lithology is poorly to moderately weathered Permian and Triassic Seven Devils volcanics, limestone, and slate, Miocene Columbia River basalt, and minor inclusions of granite. The primary geomorphic processes in these landscapes are glacial and fluvial erosion, mass wasting on oversteepened slopes and at lithologic contact zones, and cryoturbation at high elevations.

Mean annual precipitation is 15 to 45 inches (38 to 114 cm). Most precipitation occurs in the winter and spring months. Most of the precipitation occurs as snow above about 4500 feet elevation. The mean annual air temperature is 34 to 56 degrees F (1 to 13 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes, and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Low order streams are usually high gradient and moderately to deeply incised. High order streams are moderate to high gradient. Most streams transport water and sediment rapidly downstream. Wetlands occur as small springs near lithologic contact zones and in cirque basins. Lakes occur in cirque basins. Wetlands and lakes are a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and debris torrents at lower elevations. Natural fire regimes at low elevations are of high frequency, low severity and moderate to large extent. Fire regimes at mid elevations are of moderate frequency, mixed severity and moderate to large extent. Fire regimes at high elevations are of low to moderate frequency, mixed to high severity, and moderate to large extent. Mass movement is associated with summer thunderstorms, post fire conditions or, at high elevations, rapid snowmelt. Debris torrents and debris avalanches are the dominant mass wasting process. Large slump earthflows occurred historically along major geologic contact zones and areas of stream downcutting. Human-caused disturbances include modification of river flows through dam construction, alteration of plant community composition and dynamics through fire suppression and introduction of nonnative grasses and forbs, and livestock grazing. Fire suppression has altered disturbance regimes at mid elevations, creating greater risk of stand replacing fire.

Subsection Ecological Relationships:

This subsection has a repeating pattern of two primary landscape settings. These include alpine and breakland landscapes, with inclusions of cryoturbation at upper elevations and alluvial deposition along major rivers. A third component, dissected basalt plateaus, occurs around Joseph Plains.

The lower elevations are dominated by slopes of 40 to more than 80 percent. These landscapes are primarily steep mountain slopes and dissected stream breaklands. They are formed in residual and colluvial material and mixed loess. Inclusions of alluvial terraces, fans and floodplains have slopes of 1 to 30 percent. Rock outcrop is common at lowest elevations. The primary soils are shallow to deep silt loams and gravelly loams. These soils are classified

as Ultic Argixerolls and Ultic Haploxerolls. The dominant potential natural vegetation is bluebunch and Idaho fescue associations and ponderosa pine, Douglas-fir and grand fir series.

The upper elevations are alpine glaciated, with slopes of 20 to more than 80 percent. These landscapes include glacial cirques, troughs, moraines, and inclusions of cryoplanated ridges and upper slopes. They are formed in residual material, glacial till, and mixed loess. Rock outcrop is common at ridgetops. The primary soils are shallow to deep gravelly silt loams and loams. These soils are classified as Dystric Cryochrepts and Typic Cryumbrepts. The dominant potential natural vegetation is herbaceous communities on exposed ridges, and subalpine fir, whitebark pine, and grand fir series.

The dissected basalt plateaus are at mid elevations, with slopes of 3 to more than 60 percent in the dissecting canyons. Soils are formed in residual and colluvial basalt and mixed loess. They are shallow to deep silt loams and gravelly loams. These soils are classified as Ultic Argixerolls. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue associations, and ponderosa pine and Douglas-fir series.

Compiled by: Nez Perce NF, P. Green

M332Gf Ochoco-Strawberry Highlands

Location: This subsection is located in the south-west central part of the Blue Mountain Section in northeastern Oregon. It includes the highlands of the Strawberry Mountains and the basalt plateaus that flank the highlands, and extends westward into the Ochoco Mountains.

Subsection Concept: High, glaciated volcanic mountains and flanking dissected uplands dominated by basalt; this subsection includes the cold and moist highlands, cool and usually moist uplands, and cool uplands that are moisture limited during summer months; respectively with subalpine, cool moist and cool dry coniferous forests.

Subsection Setting and General Characteristics: These glaciated highlands and dissected mountains have an elevation range of 4,500 to 8,000 feet (1372 to 2438 meters). The slope gradient ranges from 5 to 90 percent. The dominant type of rock is Miocene volcanics and basalts (Strawberry volcanics, Columbia River group, Picture Gorge basalts).

Mean annual precipitation ranges from 20 to 55 inches (50 to 138 cms). Most precipitation occurs in the winter as snow. The mean annual air temperature is 35 to 45 degrees F (2 to 7 degrees C).

The dominant natural disturbance is wildfire followed by erosion. Fire is most frequent in the summer-dry, ponderosa pine forests. But fires here are of low intensity if understory fuels are not allowed to accumulate. Fires in the usually-moist, grand fir and subalpine forests are less frequent, but often more catastrophic, causing die-back of much of the overstory. Over-grazing by elk, deer or domestic livestock can cause compaction and erosion of the soil. Burrowing rodents perturbate the soil causing displacement and erosion. Timber harvest, especially on soils with an ash mantle, has resulted in compaction and displacement of soil, restricting roots and reducing the supply of soil nutrients and moisture. Roads and trails used to transport forest products and for recreation are both a source of and conduit for sediment to surface waters.

Major Ecological Components and Their Characteristics

This subsection consists of: 1) cool, dry forest dominated by Douglas fir and western larch (about 40 percent); 2) cool, moist forest dominated by grand fir (about 35 percent); and cold, moist subalpine forest dominated by subalpine fir and lodgepole pine (about 25 percent).

The cool, dry forest occurs from the lowest elevation of the subsection, 4,500 feet (1,500 meters) to as high as 5,400 feet (1,800 meters) on south facing slopes. Soils have a frigid temperature regime and xeric moisture regime. This component of the subsection is represented by soils under a moisture-limited coniferous forest with varying thickness of ash, low base-saturation, with or without a clay-enriched subsoil (Typic and Alfic Vitrixerands, Vitrandic and Ultic Haploxeralfs, and Vitrandic and Dystric Xerochrepts); and soils under ponderosa pine-grassland savanna with a dark, organic matter-rich surface layer, intermediate to high base-saturation, with or without a clay enriched subsoil (Vitrandic, Lithic and Lithic Ultic Haploxerolls; and Lithic and Typic Argixerolls). The cool, dry forest overstory is dominated by ponderosa pine, Douglas fir, grand fir and western larch. Common understory species are pinegrass, birchleaf spiraea, common snowberry, antelope bitterbrush, elk sedge, Idaho fescue, bluebunch wheatgrass and Sandberg's bluegrass.

The cool, moist forest occurs from about 4,800 to 5,600 feet (1,600 to 1,870 meters) elevation. Soils have a frigid temperature regime and udic moisture regime. These are the most productive soils; limited neither by cold temperatures or droughtiness. They commonly have a mantle of volcanic ash, with or without a clay-enriched subsoil (Alfic or Typic Udivitrands, Andic or

Vitrandid Eutroboralfs). Key species in the cool, moist forest are grand fir in the overstory with queen's cup beadlily, twinflower or big huckleberry in the understory.

A subalpine forest occurs at elevation above 5,600 feet on north aspects to 6,900 feet on south-facing slopes. Soils have a cryic temperature regime and udic moisture regime, have low base-saturation, and commonly have a mantle of ash on the surface and many rock fragments in the subsoil. Included are moderately deep and deep soils under subalpine forest with a thick ash mantle (Typic Vitricryands), with a thin ash mantle (Andic Cryumbrepts) and with a thin ash mantle and clay-enriched subsoil (Andic Cryoboralfs); under subalpine meadows are shallow soils (Lithic Cryumbrepts and Lithic Cryochrepts) and moderately deep soils with a thin ash mantle and organic matter-rich surface (Andic and Vitrandid Cryumbrepts). The dominant potential natural vegetation in the highlands consists of subalpine meadows and subalpine coniferous forest. Dominant species in the meadows include green fescue and sedges. Dominant overstory species include subalpine fir, whitebark pine and Englemann spruce; lodgepole pine commonly dominates early seral stages of subalpine fir communities following disturbance by fire. Common understory species are big huckleberry, grouse huckleberry and skunk-leaved polemonium.

Compiled by: Duane Lammers, U.S. Forest Service

M332Gg John Day-Clarno Mountains

Location: This subsection is widely distributed in the Blue Mountains Section in northeastern Oregon. It occurs at the western tip of the section in the Ochoco and Maury mountains, along the northern fringe, and on the south flank of the Elkhorn highlands.

Subsection concept: Moderately dissected mountain slopes with coniferous forest on John Day and Clarno geologic formations. This subsection is separated from other forested subsections based on lithology and from the John Day-Clarno Hills (non-forested) based on vegetation.

Subsection Setting and General Characteristics: These forested areas occur on moderately dissected mountain slopes with gradients ranging from 30 to 90 percent. Elevation ranges from 4,000 to 6,000 feet (1219 to 1829 meters). Lithology includes the Clarno and John Day formation and mixed Mesozoic sediments and volcanics; Paleocene through Oligocene dacitic to rhyolitic tuff, pumice lapilli tuff and welded ash flow tuff, and landslide debris.

Mean annual precipitation ranges from about 14 inches (35 cm), at low elevation in the rainshadow of the Cascades at the western tip of the section, to 30 inches (75 cm) in the area north of the Elkhorn highlands that has higher elevation and is influenced by moist marine air that flows through the Columbia Gorge. Precipitation is mostly as winter snow with rain in the spring and fall. The mean annual air temperature is 28 to 52 degrees F (-2 to 11 degrees C).

The dominant natural disturbance is wildfire followed by erosion. Fire is most frequent in the summer-dry, ponderosa pine forests. But fires here are of low intensity if understory fuels are not allowed to accumulate. Fires in the usually-moist, grand fir and subalpine forests are less frequent, but often more catastrophic, causing die-back of much of the overstory. Over-grazing by elk, deer or domestic livestock can cause compaction and erosion of the soil. Burrowing rodents perturbate the soil causing displacement and erosion. Timber harvest, especially on soils with an ash mantle, has resulted in compaction and displacement of soil, restricting roots and reducing the supply of soil nutrients and moisture. Roads and trails used to transport forest products and for recreation are both a source of and conduit for sediment to surface waters.

Major Ecological Components and Their Characteristics: This subsection consists of: 1) cool, very dry forest dominated by ponderosa pine, 2) cool, dry, mixed conifer forest dominated by Douglas fir, grand fir and western larch, and 3) cold, moist subalpine forest dominated by subalpine fir, Englemann spruce and lodgepole pine.

The cool, very dry forest occurs mostly in the Cascade rainshadow in the Ochoco and Maury mountains. Soil moisture regime is xeric and soil temperature regime is frigid. Representative soils have medium base saturation and organic matter-rich surface horizons, with or without a clay-enriched subsoil (Ultic Argixerolls, Ultic Paleixerolls, and Lithic Ultic Haploxerolls). These soils are continuously dry for 60 to 90 days during summer months. Ponderosa pine is the dominant overstory species and Douglas fir is present in some stands. Understory species include antelope bitterbrush, curlleaf mountain mahogany, bluebunch wheatgrass, and elk sedge.

The cool, dry, mixed forest occurs mostly at 4,000 to 5,600 feet (1219 to 1707 meters) elevation in areas north and south of the Elkhorn mountains. This area is beyond the major influence of the Cascade rainshadow and most soils are influenced by volcanic ash. Although the soil moisture regime is xeric, because of more precipitation and greater water holding capacity the period of soil moisture deficit is 45 to 60 days in summer. The soil temperature regime is frigid. This component of the map unit is represented by soils under a moisture-limited coniferous forest with varying thickness of ash, low

base-saturation, with or without a clay-enriched subsoil (Typic and Alfic Vitrixerands, Vitrandic and Ultic Haploxeralfs, and Vitrandic and Dystric Xerochrepts). The cool, dry forest overstory is dominated by Douglas fir, grand fir and western larch; ponderosa pine is also present in most stands. Common understory species are birchleaf spiraea, common snowberry, antelope bitterbrush, Idaho fescue, and pinegrass.

At elevation above 5,400 feet (1646 meters) on north aspects, soils have a cryic temperature regime and udic moisture regime, have low, base-saturation, and commonly have a mantle of ash on the surface. Included are moderately deep and deep soils under subalpine forest with a thick ash mantle (Typic Vitricryands), with a thin ash mantle (Andic Cryumbrepts) and with a thin ash mantle and clay-enriched subsoil (Andic Cryoboralfs). Dominant overstory species include subalpine fir, whitebark pine and Englemann spruce; lodgepole pine commonly dominates early seral stages of subalpine fir communities following disturbance by fire. Common understory species are big huckleberry, grouse huckleberry and skunk-leaved polemonium.

Compiled by: Duane Lammers, U. S. Forest Service

M332Gh Izee Mountain Slopes

Location: This subsection is located in the Aldrich Mountains in Grant County, Oregon, south of the town of Mt. Vernon.

Subsection Concept: This subsection consists of moderately dissected mountain slopes underlain by shale. The major general vegetation type is forest. This map unit is separated from similar subsections based upon vegetation and parent material. The adjacent Ochoco-Strawberry Basalts subsection is underlain by mixed igneous rocks. The Izee, Grasslands subsection is shrub-grassland.

Subsection Setting and General Characteristics: These mountain slopes have an elevation range of 3800 to 7000 feet (1158 to 2134 meters). The dominant slope range is 5 to 50 percent. The dominant type of bedrock is shale. The primary geomorphic process in these landscapes is erosional.

Mean annual precipitation generally ranges from 17 inches (43 cms) at lower elevations to 30 inches (75 cms) at higher elevations. Precipitation is primarily in the form of snow along with spring and fall rains and occasional thunderstorms. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

There are many intermittent and some perennial streams. These streams have produced the moderately dissected drainage pattern on the mountain slopes.

The primary natural disturbance processes are fire and insects. The main human-caused disturbances are timber harvesting and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the mountain slopes.

These mountain slopes are located on mid-elevation sites with dominant slope gradients of 5 to 50 percent. These landscapes include the dissected and undissected mountain slopes that have formed in shale. The bedrock is highly fractured and thinly bedded. The soil moisture regime is xeric with udic at higher elevations. The soil temperature regime is frigid with cryic at higher elevations. The primary soils are shallow to very deep to bedrock. The surface layer is typically shaley loam over very shaley or very channery loam. Ultic Argixerolls, Pachic Ultic Haploxerolls, Lithic Ultic Haploxerolls and Typic Xerochrepts dominate the landscape at lower elevations. Vitrandic Cryoborolls, Vitrandic Argiborolls, Pachic Udic Argiborolls and Vitrandic Haploborolls dominate the landscape at higher elevations. The soil profiles contain numerous shale fragments. The dominant potential natural vegetation consists of ponderosa pine, Douglas-fir, elk sedge, curlleaf mountain mahogany and Idaho fescue at the lower elevations. At the higher elevations it consists of Douglas-fir, grand fir, elk sedge and snowberry.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Carrie Gordon, Ochoco National Forest

M332Gi Izee Foothills

Location: This subsection is located in central Oregon along the Crook County and Grant County line, near the towns of Izee and Suplee.

Subsection Concept: This subsection consists of moderately dissected foothills underlain by shale. The major general vegetation type is shrub-grassland. This map unit is separated from similar subsections based upon parent material and vegetation. The adjacent Izee, Forested and Ochoco-Strawberry Basalts subsections are forested. The Drewsey-Hampton Grasslands and Kimberly-Paulina Hills subsections are underlain by mixed igneous rocks.

Subsection Setting and General Characteristics: These foothills a dominant elevation range of 3800 to 5000 feet (1158 to 1524 meters). The dominant slope range is 5 to 40 percent. The dominant type of bedrock is shale. The primary geomorphic process in these landscapes is erosional.

Mean annual precipitation generally ranges from 13 inches (33 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is primarily in the form of snow with spring and fall rains. The mean annual air temperature is 40 to 45 degrees F (4 to 7 degrees C).

The headwaters of the South Fork of the Crooked River occur in this subsection. Also occurring are many intermittent and some perennial streams. These streams have produced the moderately dissected drainage pattern on the foothills.

The primary natural disturbance process is fire. The main human-caused disturbance is livestock grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting: the mountain slopes.

These mountain slopes are located on mid-elevation sites with dominant slope gradients of 5 to 40 percent. These landscapes include the dissected and undissected foothill slopes that have formed from shale. The bedrock is highly fractured and thinly bedded. The soil moisture regime is xeric and the soil temperature regime is frigid, with the south-facing slopes and shallow soils being mesic. The primary soils are moderately deep and shallow to bedrock. The surface layer is typically shaley loam with a shaley or very shaley loam subsoil. Lithic Haploxerolls and Pachic Haploxerolls dominate the landscape. The soils contain numerous shale fragments and there are significant areas of shale rock outcrops. The dominant potential natural vegetation consists of bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass and antelope bitterbrush.

Compiled By: Thor Thorson, Natural Resources Conservation Service and Carrie Gordon, Ochoco National Forest

M332Gj Ukiah Mountain Slopes

Location: This subsection is located on uplands near the town of Ukiah in the northcentral part of the section in Oregon.

Subsection concept: Moderately dissected mountains with coniferous forest on Grande Rhonde and Picture Gorge basalts. This subsection is separated from other forested subsections based on lithology.

Setting and General Characteristics: This forested subsection occurs on moderately dissected mountain slopes with gradients ranging from 30 to 90 percent. Elevation ranges from 4,000 to 6,000 feet (1219 to 1829 meters). Lithology is dominantly Grande Rhonde basalt with some Picture Gorge basalt in the southern part of the unit.

Mean annual precipitation ranges from 17 to 50 inches (42 to 125 cm) occurring mostly as snow during winter months and rain in the spring and fall. Mean annual air temperature ranges from 37 to 45 degrees F (2 to 7 degrees C).

The dominant natural disturbance is wildfire followed by erosion. Fire is most frequent in the summer-dry, ponderosa pine forests. But fires here are of low intensity if understory fuels are not allowed to accumulate. Fires in the usually-moist, grand fir and subalpine forests are less frequent, but often more catastrophic, causing die-back of much of the overstory. Over-grazing by elk, deer or domestic livestock can cause compaction and erosion of the soil. Burrowing rodents perturbate the soil causing displacement and erosion. Timber harvest, especially on soils with an ash mantle, has resulted in compaction and displacement of soil, restricting roots and reducing the supply of soil nutrients and moisture. Roads and trails used to transport forest products and for recreation are both a source of and conduit for sediment to surface waters.

Major Ecological Components and Their Characteristics: This subsection consists of: 1) cool, dry and very dry forest dominated by ponderosa pine, Douglas fir and western larch (about 35 percent); 2) cool, moist forest dominated by grand fir (about 50 percent) and, 3) cold, moist subalpine forest dominated by subalpine fir (about 15 percent).

The dry and very dry forest occurs from the lowest elevation of the subsection, 4,000 feet (1,300 m), to as high as 5,400 feet (1,800 m) on south facing slopes. The soil temperature regime is frigid and the soil moisture regime xeric; soils are dry for 45 to 90 days during summer months. This component is represented by soils developed under an moisture-limited coniferous forest with varying amounts of ash, moderate base-saturation (Typic Vitrixerands, Vitrandic Xerochrepts), with a clay-enriched subsoil or organic matter-rich surface layer (Vitrandic Haploxeralfs, Vitrandic or Ultic Haploxerolls, Ultic and Lithic Ultic Argixerolls). The cool, dry forest overstory is dominated by ponderosa pine, Douglas fir, grand fir and western larch. Common understory species are pinegrass, birchleaf spiraea, common snowberry, antelope bitterbrush, elk sedge, Idaho fescue, bluebunch wheatgrass and Sandberg's bluegrass.

The cool, moist forest occurs from about 4,800 to 5,600 feet (1463 to 1707 meters) in elevation. The lower elevations are on north slopes. The soil temperature regime is frigid and the soil moisture regime is udic. These soils commonly have a mantle of volcanic ash, with or without a clay-enriched subsoil (Alfic or Typic Udivitrands, Andic or Vitrandic Eutroboralfs). Key species in the cool, moist forest are grand fir in the overstory with queen's cup beadlily, twinflower or big huckleberry in the understory.

The cold, moist, subalpine forest occurs in this subsection above 5,600 feet (1,900 m) elevation. Soils have a cryic temperature regime and udic moisture regime, have low base-saturation, and commonly have a mantle of ash on the surface and many rock fragments in the subsoil. Included are moderately deep

and deep soils under subalpine forest with a thick ash mantle (Typic Vitricryands), with a thin ash mantle (Andic Cryumbrepts) and with a thin ash mantle and clay-enriched subsoil (Andic Cryoboralfs). Dominant overstory species include subalpine fir, whitebark pine and Englemann spruce; lodgepole pine commonly dominates early seral stages of subalpine fir communities following disturbance by fire. Common understory species are big huckleberry, grouse huckleberry and skunk-leaved polemonium.

Compiled by: Duane Lammers, U. S. Forest Service

M332Gk Wallowa-Elkhorn Mountains

Location: This subsection of the Blue Mountains Section is located in the Wallowa Mountains and Elkhorn Mountains in northeastern Oregon.

Subsection Concept: The central concept of this subsection is of high, ice-sculpted mountains dominated by granitic and dioritic lithology, cold and usually moist soils, subalpine coniferous forests and alpine meadows. This map unit is separated from similar subsections based upon topography and elevation. The adjacent Minam-Tollgate subsection is at lower elevations and has less steepness of topography and landscape dissection.

Subsection Setting and General Characteristics: These mountains have an elevation ranges from nearly 10,000 feet (3,000 meters) at mountain summits to about 6,000 feet (2,000 meters) where the subalpine forest on north aspects interfinger with mesic forest communities. The dominant slope range is 15 to 60 percent. The dominant types of rocks are granites and diorites. A high percentage of the unit consists of exposed bedrock. The primary geomorphic process in these landscapes was the glaciation.

Mean annual precipitation ranges from 35 to 60 inches (88 to 150 cms). Most precipitation occurs as snow from September through May. Snow is swept by wind from exposed ridges and accumulates in drifts and in forested areas. The mean annual air temperature ranges from 28 to 42oF (-2 to 6oC).

Runoff from snowmelt and summer thunderstorms is rapid from rock outcrop and shallow soils and becomes subsurface flow in skeletal colluvium that skirts mountain peaks.

The main human-caused disturbances are mining and recreation.

Subsection Ecological Relationships:

This subsection can be described as three primary landscape segments: rock outcrop dominated aretes and rubble mantled talus slopes, alpine meadows, and subalpine coniferous forest.

The aretes are the highest segment of the landscape. They are mostly devoid of vegetation except for lichens and mosses, and patches of sedges (*Carex* spp.) on shallow organic soils (Lithic Cryofolists) on ledges and shallow depressions in the rock outcrop. These areas funnel runoff to the colluvial slopes and basins downslope. Waterfalls are common. Avalanches, rock fall and rock slides are common disturbances. Slope gradients are dominantly greater than 60 percent.

Alpine meadows occur on cirque basins, rolling benches, and mountain slopes. Dominant species include green fescue (*Festuca viridula*) and sedges (*Carex* spp.). Soils have dark, organic matter-rich surface layers and low base saturation. Soils on benches occur on slopes of 15 to 30 percent and are shallow or moderately deep and coarse textured. Soils on mountain slopes have gradients of 30 to 60 percent and tend to be stony and skeletal. These soils are classified as Lithic or Vitrandic Cryumbrepts. Common disturbance is from burrowing rodents that feed on roots and mound soil on the surface. Grazing has increased sheet and rill erosion, and where runoff concentrated gully cutting has occurred. Hiking and riding trails, capture runoff resulting in entrenchment of the trails. The short growing season hinders reestablishing vegetation on disturbed areas. Wet meadows occur on basin floors and foot slopes along path of through flow from the talus slopes. Soils in the wet meadows are organic (Terric Cryofibrists) or have an organic surface layer (Histic Cryaquepts).

The subalpine forest is on mountain slopes with gradients of 30 to 70 percent and between 6,000 and 8,500 feet elevation. Soils are cold (cryic) and usually moist (udic), have low base saturation, and commonly contain volcanic

ash and many rock fragments. Included are soils with dark, organic matter-rich surface layers (Humic Vitricryands; Vitrandic, Typic and Lithic Cryumbrepts); soils with clay-enriched subsoils (Alfic Vitricryands; Andic or Vitrandic Cryoboralfs). The conifer forest is dominated by subalpine fir series (*Abies lasiocarpa*) with stands of whitebark pine (*Pinus albicaulis*), mountain hemlock (*Tsuga mertensiana*), and Englemann spruce (*Picea engelmannii*). Lodgepole pine (*Pinus contorta*) dominates the early stage of many subalpine fir plant associations. Big huckleberry (*Vaccinium membranaceum*), grouse huckleberry (*Vaccinium scoparium*), skunk-leafed polemonium (*Polemonium pulcherrimum*), queen's cup beadlily (*Clitonia uniflora*) and pinegrass (*Calamagrostis rubescens*) are common understory species.

Notes: Small areas similar to this Subsection occur in the Snake River Canyon subsection (M332Gd) on the Seven Devils Mountains and on isolated high mountains in the John Day-Clarno, forested (M332Gg) and Minam-Tollgate, forested (M332Ga) subsections. Areas of the Ochoco-Strawberry Basalts subsection (M332Gf) above 6,500 feet elevation have similar climate, soils and plant communities, but, the lithology is dominately basalt. The soils are represented by STATSGO map units OR125 and cryic soils in OR163. Soil taxa were also taken from the legend of the Wallowa-Whitman NF Soil Survey. Potential natural vegetation was from "Plant Associations of the Blue and Ochoco Mountains" and "Plant Associations of the Wallowa-Snake Province".

Compiled by: Duane Lammers and Carrie Gordon, U. S. Forest Service and Thor Thorson, Natural Resources Conservation Service

M332G1 Grande Rhonde-Wallowa Valleys

Location: This subsection is located in northeastern Oregon.

Subsection Concept: This subsection consists of flood plains and associated terraces in the Grande Rhonde and Wallowa Valleys. The dominant geologic materials are alluvium and loess. The major general vegetative type is a grassland. This map unit is separated from similar subsections based upon its well developed flood plains and terraces. It also has higher precipitation.

Subsection Setting and General Characteristics: The flood plains and terraces have an elevation range of 2600 to 4400 feet (792 to 1341 meters). The dominant slope range is 0 to 8 percent. The dominant type of geologic materials are recent alluvium, and older alluvium having loess deposits. The primary geomorphic processes in these landscapes is fluvial associated with the flood plains and terraces, and aeolian associated with the loess deposition.

Mean annual precipitation generally ranges from 14 inches (35 cms) at lower elevations to 20 inches (50 cms) at higher elevations. Precipitation is mainly in the form of spring and fall rains, with snow in the winter and occasional summer thunderstorms. The mean annual air temperature is 44 to 51 degrees F (7 to 11 degrees C).

Streams within the subsection include the Grande Rhonde and Wallowa Rivers with numerous intermittent and perennial drainageways.

The primary natural disturbance process is ****. The main human-caused disturbance is dryland and irrigated agriculture with lesser amounts of livestock grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape components: the flood plains and the terraces. The soil moisture regime is xeric and the predominant soil temperature regime is mesic. Frigid soil temperatures occur in the Wallowa Valley east from the town of Wallowa.

The flood plains are located on low elevation sites with dominant slope gradients of 0 to 3 percent. These landscapes include the stream channels and associated flood plains that have formed in recent alluvium. The primary soils are very deep to bedrock and have seasonal water tables in late winter and early spring. These soils are occasionally or frequently flooded. The surface layer is typically silt loam or loam with a silt loam subsoil and a stratified gravelly or very gravelly loamy sand or sand substratum. The substratum is high in diatomaceous earth for the soils in the Grande Rhonde Valley. Cumulic Haploxerolls, Fluvaquentic Endoaquolls, Fluventic Haploxerolls and Cumulic Haplaquolls are the dominate soils on the flood plains. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, common snowberry and Sandberg bluegrass on the better drained soils and tufted hairgrass, redbud and sedge on the wet soils.

The terraces are located on mid-elevation sites with dominant slope gradients of 0 to 8 percent. These landscapes include the nearly level terrace top and the gently sloping escarpment that have formed from old alluvium capped by loess. The primary soils are very deep to bedrock. The surface layer is typically silt loam with a silty clay loam or clay loam subsoil. Pachic Haploxerolls, Pachic Ultic Haploxerolls, Xeric Argialbolls, Typic Argixerolls and Ultic Argixerolls are the dominant soils on the terraces. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass, common snowberry and Sandberg bluegrass.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M332Gm Flora Basalt Plateau

Location: This subsection of the Blue Mountains Section is located on a plateau lying north of the Wallowa Valley, and south and west of the Snake River Canyon in the northeast corner of Oregon.

Subsection concept: Gently sloping basalt plateau with rolling hills, dissected by canyons. This subsection is characterized by cool and usually moist coniferous forest at elevation above about 4,500 feet and a coniferous forest that is cool, but dry during the summer months below this elevation.

Subsection setting and general characteristics: This plateau has an elevation range of 3,500 to 5,500 feet (1,000 to 1,700 meters). The dominant slope range is to percent. The dominant type of rock is Miocene Columbia River basalt.

Mean annual precipitation ranges from 15 to 40 inches (38 to 100 cms). Most precipitation occurs in the winter as snow. The mean annual air temperature is 39 to 46 degrees F (4 to 8 degrees C).

The primary natural disturbance process is fire. Human-caused disturbances are associated with fire and timber harvest.

Major Ecological Components and Their Characteristics: This subsection consists of: 1) cool, moist forest dominated by grand fir (about 55 percent) and 2) cool, dry forest dominated by Douglas fir and western larch (about 45 percent).

The cool, moist forest occurs above about 4,500 feet (1,500 meters) elevation in this subsection. Soils are cool (frigid) and usually moist (udic). Under a coniferous forest canopy they have a thick mantle of volcanic ash (Typic Udivitrands) without a clay-enriched subsoil, or (Alfic Udivitrands, Andic or Vitrandic Eutroboralfs) with a clay-enriched subsoil. The dominant potential natural vegetation on the usually moist soils is the grand fir (*Abies grandis*) series. Lodgepole pine (*Pinus contorta*), Ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*) and Douglas fir (*Pseudotsuga menziesii*) are common overstory species. Engelmann spruce (*Picea engelmannii*) may codominate with grand fir in late seral stands on moist sites. Understory species are Queen's cup beadlily (*Clitonia uniflora*), twinflower (*Linnaea borealis*), big huckleberry (*Vaccinium membranaceum*), and grouse huckleberry (*Vaccinium scoparium*).

Areas below about 4,500 feet (1,500 meters) elevation in this subsection are dominated by a cool, dry forest. Soils have a frigid temperature regime and a xeric moisture regime; soils are dry for 45 to 60 days during summer months. This component of the subsection is represented by soils developed under a moisture-limited forest, with varying thickness of volcanic ash often mixed with colluvium or eolium (Typic Vitrixerands, Vitrandic Xerochrepts) with clay-enriched subsoil (Vitrandic Haploxeralfs) and dark, organic matter-rich surface layer (Vitrandic Haploxerolls). Included are soils usually associated with grasslands that are shallow or have many rock fragments or both, and an organic matter-rich surface layer (Lithic and Vitrandic Haploxerolls, Lithic and Typic Argixerolls). The dominate overstory species are Douglas fir, western larch and grand fir with ponderosa pine present in most stands; spiraea (*Spiraea betulifolia*), common snowberry (*Symphoricarpos albus*) and elk sedge (*Carex geyeri*) are key understory species.

Compiled by: Duane Lammers and Larry Chitwood, U.S. Forest Service

M332Gn Wallowa Grasslands

Location: This subsection is located in Wallowa County in northeastern Oregon.

Subsection Concept: This subsection consists of grassland basalt plateaus in the Wallowa Valley. This subsection is separated from adjacent ones based on landform, topography and vegetation. The adjacent Flora Basalt Plateau Subsectin is Forested. The Grande Rhonde-Wallowa Valley Subsection is characterized by terraces and flood plains. The Snake River Canyon Subsection is a steeply dissected grassland.

Subsection Setting and General Characteristics: These plateaus have an elevation range of 3500 to 5000 feet (1067 to 1524 meters). The dominant slope range is 2 to 30 percent. The dominant type of rock is miocene basalt. The primary geomorphic processes in these landscapes is erosional.

Mean annual precipitation generally ranges from 14 inches (35 cms) at lower elevations to 20 inches (50 cms) at higher elevations. Precipitation is mainly in the form of spring and fall rains, snow in the winter and occasional summer thunderstorms. The mean annual air temperature is 42 to 45 degrees F (6 to 7 degrees C).

The primary natural disturbance process is fire. The main human-caused disturbances are dryland agriculture and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of one primary landscape component: the basalt plateau.

These plateaus are located on low to mid-elevation sites. This landscape component is comprised of a nearly level to gently sloping basalt plateau capped with a thin deposit of loess. The dominant slope gradients are 2 to 30 percent. The plateau has a dip slope to the south. The soil moisture regime is xeric and the soil temperature regime is frigid. The primary soils are moderately deep to bedrock. The surface layer is typically silt loam with a silty clay loam or silty clay subsoil. Vitrandic Argixerolls, Pachic Argixerolls, Typic Paleixerolls and Pachic Haploxerolls are the dominant soils on this plateau. The dominant potential natural vegetation consists of Idaho fescue, bluebunch wheatgrass and common snowberry.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M332Go Baker Valley Grasslands

Location: This subsection is located in Baker County, Oregon.

Subsection Concept: This subsection consists of alluvial flood plains and terraces, and adjacent hills. The major general vegetative type is a shrub-grassland. This map unit is separated from adjacent subsections because it is a shrub-grassland with relatively gentle slopes compared to the surrounding areas which are either forested, have steeper slopes or do not contain flood plains and terraces.

Subsection Setting and General Characteristics: These flood plains, terraces and hills have an elevation range of 2000 to 5500 feet (610 to 1676 meters). The dominant slope range is 0 to 35 percent. The dominant geologic materials are quaternary alluvium, Paleozoic and Mesozoic mixed volcanics and sedimentary rocks, Clarno Formation, Tuffaceous sedimentary rocks and tuff. The primary geomorphic processes in these landscapes is fluvial associated with the alluvial bottomlands and terraces.

Mean annual precipitation generally ranges from 9 inches (23 cms) at lower elevations to 16 inches (40 cms) at higher elevations. Precipitation is mainly in the form of snow at the higher elevations with rain and snow at the lower elevations. The period of precipitation is from about October through May. The mean annual air temperature is 40 to 50 degrees F (4 to 10 degrees C).

Streams within the subsection include the Burnt and Powder Rivers. Also included are some perennial streams and the Unity and Bronwlee Reservoirs.

The primary natural disturbance process is fire. The main human-caused disturbances are livestock grazing and irrigated agriculture.

Subsection Ecological Relationships:

This subsection consists of three primary landscape components: flood plains, terraces and rolling hills. The soils below an elevation of about 4000 feet have an aridic soil moisture regime (less than 12 inches annual precipitation) and a mesic soil temperature regime. The soils above 4000 feet have a xeric soil moisture regime (greater than 12 inches annual precipitation) and a frigid soil temperature regime.

The flood plains are located on low elevation sites with dominant slope gradients of 0 to 2 percent. These landscapes include the stream channels and associated flood plains that have formed in recent alluvium. The primary soils are very deep to bedrock and are subject to rare or occasional flooding. The surface layer is typically silt loam with a silt loam or silty clay loam subsoil. The soils with poor internal drainage have saline and sodic limitatins. Pachic Haploxerolls, Typic Haplaquepts, and Typic Halaquepts are the dominant soils on the flood plains. The dominant potential natural vegetation consists of tufted hairgrass, sedge, Baltic rush, inland saltgrass and lesser amounts of black greasewood.

The terraces are located on low to mid-elevation sites with dominant slope gradients of 2 to 20 percent. These landscapes include the nearly level terrace top and steep escarpment that have formed in alluvium. The primary soils on the lower terraces are very deep to bedrock. The surface layer is typically silt loam or loam with a clay loam or clay subsoil. Aridic Argixerolls, Xeric Argidurids, Aridic Calcic Argixerolls and Xeric Haplcambids are the dominant soils on the lower terraces. The primary soils on the higher terraces are very deep to bedrock and typically have a hardpan or dense clay layer within 40 inches of the soil surface. The surface layer is typically silt loam with a silty clay loam or clay subsoil. The substratum below the hardpan or clay pan consists of very gravelly loam. Typic Palexerolls, Pachic Palexerolls and Typic Durixerolls are the dominant soils on the upper

terraces. The dominant potential natural vegetation consists of bluebunch wheatgrass, Wyoming big sagebrush, Sandberg bluegrass and Idaho fescue at lower and warmer elevations. The cooler, higher elevations are dominated by Idaho fescue, mountain big sagebrush, antelope bitterbrush and squaw apple.

The rolling hills are located on high elevation sites with dominant slope gradients of 2 to 35 percent with some steeper slope segments ranging to 60 percent. The primary soils are shallow and moderately deep to bedrock. The surface layer is typically very cobbly, silt loam with a very cobbly clay loam subsoil. Calcic Argixerolls, Lithic Argixerolls, Typic Argixerolls and Pachic Argixerolls are the dominant soils on the rolling hills. The dominant potential natural vegetation consists of bluebunch wheatgrass, Wyoming big sagebrush, Sandberg bluegrass and Idaho fescue at the lower and warmer elevations. The cooler, higher elevations are dominated by Idaho fescue, mountain big sagebrush, antelope bitterbrush and squaw apple.

Compiled By: Thor Thorson, Natural Resources Conservation Service

M332Gp Hornet Plateau

Location: This subsection is located in west central Idaho; east of the Snake River Canyon, south of the Seven Devils Mountains, and north of the Cuddy Mountains and Council Valley. The eastern portion of the unit includes Meadows Valley and a segment of the Little Salmon River.

Subsection Concept: This subsection consists of a gently-sloping, basalt plateau with periglacial uplands and mountain slopes that have been uplifted and dissected by fluvial erosion. Mixed conifer stands (Douglas fir, Grand fir, and Ponderosa pine series) dominate the middle to lower elevations, and Subalpine fir communities occur at upper elevations in the northern portion of the unit. This map unit is separated from similar subsections based upon the physiographic contrast and extent of gentle to moderate slopes associated with the plateau uplands.

Subsection Setting and General Characteristics: These volcanic plateau uplands, periglacial (frost churned) uplands, and fluvial mountain slopes have an average elevation range of 4000 to 8000 feet (~ 610 to 2440 meters). Dominant local relief is about 100 to 500 feet (~ 30 to 150 meters) in the foothills, and 1000 to 1500 feet (~ 300 to 460 meters) in the uplands. Slope gradient ranges from 0 to 80 percent; dominantly 15 to 40 percent. The dominant lithology is Columbia River basalts with intrusions of Permian-Triassic volcanics near the northern and western boundaries and metamorphosed granitic rocks (e.g., granodiorite, quartz diorite) in the southeast portion of the unit. The primary geomorphic processes in these landscapes are faulting and uplift, frost churning, and fluvial erosion.

Mean annual precipitation ranges from 20 inches (~ 50 centimeters) in the lower elevation plateau uplands to 35 inches (~ 89 centimeters) in the periglacial uplands and mountains. Higher-elevation landscapes may receive up to 40 inches (~ 102 centimeters) in localized areas. Most precipitation occurs during October through April. At mid to upper elevations above 5000 feet, 80 percent of the total precipitation falls as snow. Winter rain is common in December and January at elevations below 5000 feet. Mean annual air temperature is 27 to 45 degrees F (~ minus 3 to plus 7 degrees Centigrade).

The periglacial uplands generally have weakly expressed drainage patterns, whereas the plateau lands and fluvial landscapes are moderately dissected with parallel and dendritic drainages. Some of the major streams and rivers include Bear Creek, Indian Creek, Boulder Creek, and the West Fork of the Weiser River. Most precipitation is delivered to streams as subsurface flow rather than surface runoff. Wet meadows and riparian stream reaches occur on low-gradient depositional landforms. Natural lakes are a minor component within this subsection, and Lost Valley Reservoir is the main body of water.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and fluvial erosion. Mass movements such as debris slides and slumps are localized and mainly occur along geological contact zones and areas of extreme fluvial entrenchment. The plateau uplands and upper-elevation mountain slopes are relatively stable. Human-caused disturbances include timber harvest, recreational development, livestock grazing, and historical mining in localized areas.

Subsection Ecological Relationships:

This subsection consists of four primary landscape settings; 1) Periglacial (Frost Churned) Uplands and Mountain Slopes (about 35 percent of area), 2) Plateaus and Escarpments (about 35 percent of area), and 3) Fluvial Mountains (about 15 percent of area), and 4) Depositional Lands (about 15 percent of area).

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of

glaciation. Elevation ranges from approximately 6000 to 7500 feet (~ 1830 to 2290 meters).

Plateaus and escarpments (15 to 80 percent slopes) are characterized by volcanic plateau uplands and canyon escarpments that have been uplifted and faulted. Elevation ranges from 4000 to 6000 feet (~ 1220 to 1830 meters).

Fluvial Mountains (30 to 50 percent slopes) are characterized by dissected mountain slopes with narrow ridges and V-shaped drainages formed by the erosive force of running water. Elevation ranges from 4000 to 6000 feet (~ 1220 to 1830 meters).

Depositional Lands (0 to 20 percent slopes) consist of alluvial landforms in valley bottoms and along stream terraces in lowland positions. Elevation ranges from 4000 to 7000 feet (~ 1220 to 2130 meters).

Dominant soils are shallow to moderately deep silt loams and loams on mountain slopes and escarpments. Soil depths vary on plateau summits and periglacial landscapes, but they generally have sandy loam, silt loam, and loam textures. Soils are classified as Ultic and Lithic Ultic Haploxerolls and Argixerolls on low-elevation uplands and plateaus with dry/warm aspects. Typic and Lithic Cryoborolls, Cryochrepts, and Cryumbrepts generally occur at elevations above 5000 feet. There are numerous basalt outcrops in this map unit, especially in the southwestern portion, where Lithic subgroups commonly occur.

Potential natural vegetation is dominated by mixed conifer stands of Douglas fir, Grand fir, and Ponderosa pine series that generally occur below 6000 feet. Grand fir commonly occupies northerly aspects with deep soils. Subalpine fir with natural shrub/grass openings occur on upper elevation slopes, above 6500 feet, and along cool air drainages in the northern portion of the unit. Scattered Ponderosa pine and shrub/grassland (bluebunch wheatgrass and Idaho fescue) communities occur on lower-elevation plateaus and escarpments.

Compiled By: Payette National Forest; R. Jorgensen

M332Gq Sturgil Peak Plateau

Location: This subsection is located in west central Idaho and a small portion of eastern Oregon that includes some of the Snake River Canyon in the west, and the eastern slopes are adjacent to the Weiser River basin. The area contains the Hitt Mountain and Cuddy Mountain ranges and a segment of the Snake River, including Brownlee Reservoir.

Subsection Concept: This subsection consists of volcanic plateau uplands, canyon escarpments, and mountain ridges that have been uplifted and dissected by fluvial erosion. Mixed conifer stands (Douglas fir and Ponderosa pine series) and shrub/grassland communities dominate the middle and lower elevations. Subalpine fir communities occur on weakly glaciated and frost churned landscapes above 6500 feet. This map unit is separated from similar subsections based upon bedrock lithology and the strong physiographic contrast of dominant landforms.

Subsection Setting and General Characteristics: These plateau uplands, canyonlands, and mountains have an average elevation range of 2000 to 7500 feet (~ 610 to 2290 meters). Dominant local relief is about 600 to 1000 feet (~ 180 to 300 meters) in the foothills, 1000 to 1500 feet (~ 300 to 460 meters) in the uplands, and 3800 to 5000 feet in the entrenched canyonlands. Slope gradient ranges from 0 to 80 percent; dominantly 15 to 40 percent on upland landscapes and 40 to 80 percent on canyon escarpments. The dominant lithology is Columbia River basalts with intrusions of Permian-Triassic volcanics and metamorphosed granitic rocks (e.g., granodiorite, quartz diorite) at upper elevations. The primary geomorphic processes in these landscapes are faulting and uplift, frost churning, and fluvial erosion. Minor areas of weak glaciation occur on upper-elevation mountainous terrain.

Mean annual precipitation ranges from 15 inches (~ 38 centimeters) in the lower elevation plateaus and canyonlands to 35 inches (~ 89 centimeters) on periglacial uplands and mountains. Higher elevations may receive up to 40 inches (~ 102 centimeters) in localized areas. Large variations occur across this subsection because of the wide range in elevation. Most precipitation occurs during October through April. At mid to upper elevations above 5000 feet, 80 percent of the total precipitation falls as snow. Winter rain is common in December and January at elevations below 5000 feet. Mean annual air temperature is 28 to 53 degrees F (~ minus 2 to plus 11 degrees Centigrade).

The landscape is highly dissected with parallel and dendritic drainage patterns that eventually drain into Brownlee Reservoir and the Wildhorse and Weiser Rivers. Most precipitation is delivered to streams as subsurface flow rather than surface runoff. Riparian stream reaches occur on low-gradient depositional landforms. There are few wet meadows, and Brownlee Reservoir is the main body of water contained within this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and fluvial erosion. Mass movements such as debris slides and slumps are localized and mainly occur along geological contact zones and areas of extreme fluvial entrenchment. The plateau uplands and upper-elevation mountain slopes are relatively stable. Human-caused disturbances include timber harvest, recreational development, historical and current mining activities, and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Periglacial (Frost Churned) Uplands and Mountain Slopes, 2) Fluvial Mountains, and 3) Plateaus and Escarpments. Alluvial landforms comprise valley bottoms and stream terraces in lowland positions of these landscapes.

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of

glaciation. Elevation ranges from approximately 6000 to 7500 feet (~ 1830 to 2290 meters).

Fluvial Mountains (30 to 50 percent slopes) are characterized by dissected mountain slopes with narrow ridges and V-shaped drainages formed by the erosive force of running water. Elevation ranges from 4000 to 6000 feet (~ 1220 to 1830 meters).

Plateaus and escarpments (15 to 80 percent slopes) are characterized by volcanic plateau uplands and canyon escarpments that have been uplifted and faulted. Elevation ranges from 2000 to 6000 feet (~ 610 to 1830 meters).

Dominant soils are shallow to moderately deep silt loams and loams on mountain slopes and escarpments. Soil depths vary on plateau summits and periglacial landscapes, but they generally have sandy loam, silt loam, and loam textures. Soils are classified as Ultic and Lithic Ultic Haploxerolls and Argixerolls on low-elevation uplands and plateaus with dry/warm aspects. Typic and Lithic Cryoborolls and Cryumbrepts generally occur at elevations above 5000 feet. There are many low knobs and basalt outcrops in this map unit where Lithic subgroups commonly occur.

Potential natural vegetation is dominated by mixed conifer stands of Douglas fir and Ponderosa pine series that generally occur below 6000 feet. Grand fir occupies much of the moderately sloping terrain with deeper soils. Subalpine fir with natural shrub/grass openings occur on upper elevation slopes. Scattered Ponderosa pine and shrub/grassland (bluebunch wheatgrass and Idaho fescue) communities occur on lower-elevation plateaus and escarpments.

Compiled By: Payette National Forest; R. Jorgensen

M332Gr Weiser Valley and Foothills

Location: This subsection is located in the Weiser River basin of west central Idaho.

Subsection Concept: This subsection consists of Miocene plateau and associated alluvial valleys of basalt bedrock that have been modified by surface weathering and geologic erosion. The major general vegetative types include sagebrush/grass communities. This map unit is separated from similar subsections based upon geologic material - the Idaho batholith surrounds this subsection to the west, north and east.

Subsection Setting and General Characteristics: These Miocene basalt plateaus have an elevation range of 3000 to 4200 feet/1000 to 1400 meters. The dominant slope range is 2 to 60 percent. The dominant types of rocks are basalt. The primary geomorphic processes in these landscapes are residual and alluvial.

Mean annual precipitation is 11 inches/28 cms at Porter's Ferry to 26 inches/66 cms at Council. Precipitation around Weiser is a function of the semi-arid desert weather condition while patterns at Council are controlled by the surrounding mountainous terrain. Most precipitation occurs in the winter with 60 percent of the precipitation falling as snow. The mean annual air temperature is 48 degrees F/9 degrees C. at Council and 51 degrees F./10 degrees C. at Weiser.

Weiser River is a major stream with numerous tributary creeks. Streams typically occur with broad stream terraces and flood plains. The landscape is slightly dissected in areas adjoining the River and moderately dissected in the upland areas. Wetlands are associated with the lowest of the stream terrace positions near the Weiser River and other creeks.

The primary natural disturbance processes are surface erosion. Human-caused disturbances include farming and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include stream terraces and moderately dissected basalt plateaus.

The stream terraces are located on low elevation sites with dominant slope gradients from 2 to 8 percent. These landscapes include flood plains, alluvial terraces, fan terraces and terrace side slopes. Soils are formed in alluvium that is mostly mixed, but has a significant amount of material from basaltic sources. Included soil classification are: Typic Haploxerolls, Typic and Entic Haplaquolls and Typic Xerorthents. Dominant natural vegetation includes grasses and wet tolerant plants.

The basalt plateaus are located at middle and higher elevation sites with dominant slope gradients of 12 to 50 percent. These landscapes include basalt ridges, basalt terraces and associated side slopes. Soils are from both parent rock and some alluvial influence. Included soil classifications are Typic and Lithic Haploxerolls, Argixerolls and Xerochrepts. Dominant natural vegetation is Wyoming Sagebrush, bluebunch wheatgrass and Idaho Fescue.

Compiled By: Natural Resources Conservation Service, Harley Noe, and Boise National Forest, Leah Juarros

M332Gs Council Mountain Uplands

Location: This subsection is located on a mountain ridge in north central Idaho that lies between Long Valley and Cascade Reservoir to the east and the basin area comprised of Council Valley and Indian Valley to the west.

Subsection Concept: This subsection consists of a block faulted mountain and upland area that has moderate slopes dipping to the west and steep escarpments sloping to the east. Subalpine fir communities dominate the upper-elevation mountain slopes with mixed conifer stands of Grand fir, Douglas fir, and Ponderosa pine occurring at lower elevations on warmer sites. This map unit is separated from similar subsections based upon bedrock lithology and physiographic relationships of the dominant landforms.

Subsection Setting and General Characteristics: These periglacial (frost churned) uplands and fluvial mountains have an average elevation range of 4000 to 8100 feet (~ 1220 to 2470 meters); Median elevation is about 5000 feet (~ 1520 meters). Dominant local relief is about 2000 feet (~ 610 meters). Moderately steep dip slopes have gradients of 30 to 50 percent and escarpments have slopes up to 70 percent, but dominant slopes of this map unit are 15 to 40 percent. The dominant lithology is a westward tilted block of Columbia River basalts with a west central core of granitics (e.g., granodiorite, quartz diorite) that constitutes about 20 percent of the area. The primary geomorphic processes in these landscapes are faulting and uplift, frost churning, and fluvial erosion. Minor areas of glaciation occur on the east side of Council Mountain ridge.

Mean annual precipitation ranges from 25 inches (~ 64 centimeters) in the lower elevation mountains and plateaus to 45 inches (~ 114 centimeters) on periglacial landscapes. Nearly 80 percent of the precipitation occurs during October through April. At elevations above 5000 feet, nearly 90 percent of the total precipitation falls as snow. Mean annual air temperature is 27 to 45 degrees F (~ minus 3 to plus 7 degrees Centigrade).

The landscape is moderately to highly dissected by numerous drainages that comprise the eastern headwaters of the Weiser River. Water yield is mainly from subsurface flows. Surface runoff generally occurs during high intensity storms on the shallow soil portions only. Wet meadows and riparian reaches occur on low-gradient depositional landforms with poorly drained soils. There are no lakes or major bodies of water within this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, and fluvial erosion. Mass movements such as debris slides and slumps rarely occur on these lands. The landscape is relatively stable due to moderate slope gradients. Human-caused disturbances include timber harvest, recreational development, and livestock grazing.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Periglacial (Frost Churned) Uplands and Mountain Slopes (about 50 percent of area), 2) Fluvial Mountains (about 15 percent of area), and 3) Plateaus and Escarpments (about 35 percent of area).

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation ranges from approximately 6000 to 8000 feet (~ 1830 to 2440 meters).

Fluvial Mountains (30 to 50 percent slopes) are characterized by dissected mountain slopes with narrow ridges and V-shaped drainages formed by the erosive force of running water. Elevation ranges from 4000 to 6000 feet (~ 1220 to 1830 meters).

Plateaus and escarpments (15 to 70 percent slopes) are characterized by structurally-controlled volcanic flows that have been uplifted and faulted. Elevation ranges from 4000 to 6000 feet (~ 1220 to 1830 meters).

Dominant soils are shallow to moderately deep silt loams and loams on mountain slopes and escarpments. Soil depths vary on plateau summits and periglacial landscapes, but they generally have sandy loam, silt loam, and loam textures. Soils are classified as Ultic and Lithic Ultic Haploxerolls and Argixerolls on low-elevation fluvial uplands with dry aspects. Typic and Lithic Cryoborolls and Cryumbrepts generally occur at elevations above 5000 feet. There are many low knobs and basalt outcrops in this map unit where Lithic subgroups commonly occur.

Potential natural vegetation is dominated by mixed conifer stands of Douglas fir series that generally occur below 6000 feet. Grand fir occupies much of the moderately sloping terrain with deeper soils and southerly aspects, and subalpine fir with shrub/grass communities occur on upper elevation slopes. Scattered stands of Ponderosa pine and shrub/grass communities occur at the lowest elevations on dry aspects.

Compiled By: Payette National Forest; R. Jorgensen

M332Gt High Valley

Location: This subsection is located in the Payette River Basin of west central Idaho.

Subsection Concept: This subsection consists of gently westward tilted dissected uplands of quartz monzonite and Columbia River basalts that have been modified by fluvial processes. The general vegetative types vary from open grass-brush to dense Douglas fir and ponderosa pine. This map unit is separated from similar subsections based upon faulted upland complex of mainly granitic and basalt rock.

Subsection Setting and General Characteristics: These tilted uplands have an elevation range of 3500 to 8000 feet/1065 to 2430 meters. The dominant slope range is 20 to 65 percent. The dominant types of rocks are granite and Columbia River basalts in the lower western slopes. The primary geomorphic process in these landscapes are fluvial.

Mean annual precipitation ranges from 25 inches/63 cms in the valley bottoms to 45 inches/114 cms in the mountains. Most precipitation occurs in the winter and spring with 65 percent of the precipitation falling as snow. The mean annual air temperature is 52 degrees F/11 degrees C.

V-shaped drainages dissect the fluvial slopes at moderate to wide intervals. The westward tilting of the structurally controlled basalts keep water flowing in a southwest direction and much of the flow is restricted in steep escarpments. Overall, the landscape is weak to moderately dissected.

The primary natural disturbance processes are fire, insects, disease, and dry ravel or spalling. Human-caused disturbances include grazing and recreation.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include 30 percent Granitic Fluvial Lands, 25 percent Structurally controlled Basalt Lands, and 20 percent Mature Relief Fluvial lands.

The Granitic Fluvial Lands are located on mid elevation sites with slopes commonly over 60 percent. These landscapes include steep mountain slopes that are formed in granitic parent material. The primary soils are variable in depth, with sandy or loamy textures which may or may not be skeletal. These soils are classified as Typic and Lithic Cryorthents, and Xerorthents. The dominant potential natural vegetation is grass-brush on droughty south-facing slopes to dense stand of Douglas fir and ponderosa pine.

The Structurally controlled Basalt lands are located on mid elevation sites with dominant slope gradients from 30 to 50 percent, with the escarpments ranging up to 65 percent. These landscapes include volcanic slopes that have been tilted and uplifted. The primary soils are shallow or moderately deep with a clay loam subsoil. These soils have more strongly expressed horizon development than those formed on granitic materials. These soils are classified as Typic and Lithic Crumbrepts, Ultic Haploxeralfs and Mollic Cryoboralfs. The dominant potential natural vegetation is open-grass communities to Douglas fir types.

The Mature Relief Fluvial lands are located on mid elevation sites with dominant slope gradients from 45 to 65 percent. These landscapes include steep mountain slopes that are formed in granitic parent material. The primary soils are variable in depth, with sandy or coarse loamy textures, which may or may not be skeletal. These soils are classified as Typic and Lithic Cryochrepts. Poor gradation of materials in the soil and underlying weathered bedrock result in a fragile, erosive slope. The dominant potential natural vegetation is grass-brush on droughty south-facing slopes to dense stand of Douglas fir and ponderosa pine. Activities that remove the

vegetative cover, disturb the surface soil, or change the hydrologic function tend to greatly accelerate the surface erosion or sediment yield of these slopes.

This subsection is important in recreation, especially the West Mountain area. There is also the Sage Hen Reservoir which is a recreation site. The name change is recommended because there is an area in an adjacent subsection that is referred to by locals as Round Valley. Also, this subsection contains High Valley, another recreation area.

Compiled By: Leah Juarros, Boise National Forest

M332Gu Boise Foothills-Squaw Butte

Location: This subsection is located in the Payette River basin of southwestern Idaho.

Subsection Concept: This subsection consists of fluvial side slopes of granitic material in the foothills and basalt plateau at Squaw Butte. These landscapes have been modified by fluvial processes. The major general vegetative types include sagebrush and bitterbrush/grass communities. This map unit is separated from similar subsections based upon the complex combination of parent materials and landscape differences. The continuous granitics of the Idaho batholith are to the east and south. Continuous flows of Columbia River basalts are to the north and west.

Subsection Setting and General Characteristics: These fluvial slopes have an elevation range of 2200 to 4000 feet/730 to 1330 meters. The dominant slope range is 4 to 35 percent. The dominant types of rocks are granitics and granodiorite in the foothills, and basalt in the Squaw Butte area. The primary geomorphic process(es) in these landscapes are fluvial, and residual.

Mean annual precipitation is 13 inches/33 cms at Black Canyon Reservoir and 18 inches/46 cms in Brownlee. Most precipitation occurs in the fall and winter with 60 percent of the precipitation falling as snow. The mean annual air temperature is 48 to 51 degrees F/9-10 degrees C.

The Payette River and tributary streams typically occur on narrow stream terraces. The landscape is slightly dissected. Wetlands of minimal importance are located in lower alluvial areas adjacent to active streams.

The primary natural disturbance processes are fire and slope instability. Human-caused disturbances include suburban development, but are minimal at this time.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting. This is rolling granitic fluvial slopes.

The granitic hills are located on mid elevation sites with dominant slope gradients from 8 to 30 percent. Significant dissection has occurred. Primary soils are moderately deep and deep loams and sandy loams. These soils are classified as Entic and Typic Haploxerolls, Typic and Aridic Argixerolls and Typic Xerorthents. Dominant natural vegetation is Wyoming Sagebrush, Bitterbrush, bluebunch wheatgrass, and Idaho Fescue at the higher elevations.

Compiled By: Harley Noe, Natural Resources Conservation Service and Leah Juarros, Boise National Forest

M332Gv Seven Devils Mountains

Location: This subsection is located on a mountain ridge system in west central Idaho; east of Hells Canyon, west of Riggins and the Salmon River Canyonlands, north of the basalt uplands of the Hornet Plateau, and south of the Triangle Mountain plateau remnants. The area includes a portion of the Hells Canyon Wilderness and National Recreation Area.

Subsection Concept: This subsection consists of extremely steep, uplifted and glaciated mountains composed mainly of Seven Devils volcanics. Subalpine fir and shrub/grass communities dominate the upper-elevation mountain slopes with mixed conifer stands of Grand fir, Douglas fir, and Ponderosa pine occurring at intermediate and lower elevations. This map unit is separated from similar subsections based upon bedrock lithology and the physiographic contrast of dominant landforms.

Subsection Setting and General Characteristics: These mountains have an average elevation range of 3000 to 9400 feet (~ 900 to 2870 meters); Median elevation is about 6000 feet (~ 1830 meters). Dominant local relief is about 3000 to 3500 feet (~ 900 to 1070 meters). Slope gradient ranges from 30 to 90 percent, dominantly 40 to 80 percent. The dominant lithology is Seven Devils volcanics (e.g., metamorphosed andesites, rhyolite, quartzites, and tuffs) of Permian to Triassic age. A few remnant basalt caps and intrusions of other granitic and metamorphic rocks also occur in localized areas. The primary geomorphic processes in these landscapes are uplift and glaciation followed by frost churning and fluvial erosion.

Mean annual precipitation ranges from 15 inches (~ 38 centimeters) in the lower elevation fluvial landscapes to 45 inches (~ 114 centimeters) in the glaciated mountains and uplands. Higher-elevation landscapes may receive up to 50 inches (127 centimeters) in localized areas. Large variations occur across this subsection because of the wide range in elevation. Most precipitation occurs during October through April. At mid to upper elevations above 5000 feet, 85 percent of the total precipitation falls as snow. Winter rain is common in December and January at elevations below 5000 feet. Mean annual air temperature is 24 to 47 degrees F (~ minus 5 to plus 8 degrees Centigrade).

The high-elevation glaciated lands are high water producers. Small lakes and wet meadows store water in cirque basins and provide continual water yield to perennial streams. The periglacial uplands and fluvial landscapes are weakly to moderately dissected with surface streams and rivers including Squaw Creek, Race Creek, Papoose Creek, Sheep Creek, Rapid River, and a portion of the Little Salmon River. Riparian stream reaches with high water tables occur on low-gradient depositional landforms.

The primary natural disturbance processes are wildfire, insect and disease epidemics, fluvial erosion, and mass wasting. The glaciated lands are subject to high runoff from intense storms, but most remain relatively stable due to high percentages of surface rock fragments. Deep snows and steep slopes contribute to the high hazard for snow avalanches, and debris slides occur in some of the steeper drainages of the lower elevation fluvial mountains. Human-caused disturbances include timber harvest, recreational development, livestock grazing, and historical mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings; 1) Glaciated Mountains (about 50 percent of area), 2) Periglacial (Frost Churned) Uplands and Mountain Slopes (about 15 percent of area), and 3) Fluvial Mountains (about 25 percent of area). Depositional landforms and plateau summits comprise the remaining 10 percent of the area.

The Glaciated Mountain landscapes are characterized by high-elevation mountain

peaks with average slopes of 40 to 80 percent, glacial trough sideslopes of 30 to 60 percent, and ice-scoured cirque basins with 10 to 40 percent slopes. Elevation ranges from approximately 6500 to 9400 feet (1980 to 2870 meters).

Periglacial Uplands and Mountain Slopes (15 to 40 percent slopes) consist of rolling hills and upland landscapes that reflect the localized effects of glaciation. Elevation ranges from approximately 5500 to 7500 feet (~ 1680 to 2290 meters).

Fluvial Mountains (30 to 50 percent slopes) are characterized by dissected mountain slopes with narrow ridges and V-shaped drainages formed by the erosive force of running water. Elevation ranges from 3000 to 6000 feet (~ 900 to 1830 meters).

Dominant soils are shallow to moderately deep loams and sandy loams on mountain slopes and escarpments. Soil depths vary on periglacial uplands and moderately sloping landscapes, but they generally have sandy loam, silt loam, and loam textures. Soils are classified as Ultic and Lithic Ultic Haploxerolls and Argixerolls on low-elevation fluvial uplands with dry aspects. Typic and Lithic Cryochrepts and Cryumbrepts generally occur at elevations above 5000 feet. Lithic subgroups are associated with areas of exposed bedrock on steep mountain sideslopes and glacially scoured uplands.

Potential natural vegetation is dominated by mixed conifer stands of Douglas fir, Grand fir and Ponderosa pine series that generally occur below 6000 feet. Grand fir occupies much of the moderately sloping terrain with deeper soils on northerly aspects. Subalpine fir with shrub/grass communities occur on upper elevation slopes, above 6500 feet. Scattered stands of Ponderosa pine and shrub/grass communities (bluebunch wheatgrass and Idaho fescue) occur at the lowest elevations on dry aspects.

Compiled By: Payette National Forest; R. Jorgensen

M333Aa Pend Oreille Hills and Valleys

Location: This subsection is located in the Pend Oreille and Spokane river basins of northeast Washington and northern Idaho.

Subsection Concept: This subsection mainly consists of valleys, hills, rolling uplands and mountains formed by a complex of major geologic structures which include: Precambrian metasedimentary bedrock, which includes primarily quartzites, siltites, and argillites; and Cretaceous Kaniksu Batholith which includes a mix of granite, granodiorite and quartz monzonite. Continental glaciation, stream down cutting, slope erosion, and deposition make up the dominant land-forming processes. Mesic coniferous forests dominates these landscapes. This map unit is separated from similar subsections based on its mix of geology types, low relief landscapes and mix of glaciated and residual landscapes.

Subsection Setting and General Characteristics: These valleys, hills, rolling uplands and mountains have an elevation range of 2150 to 5100 feet (655 to 1554 meters). The dominant slope range is 10 to 70 percent. The primary geomorphic process in these landscapes is continental glaciation and fluvial processes.

Mean annual precipitation ranges from 25 inches/64 cms at the lowest elevations to 50 inches/127 cms at the highest elevations. Most of the precipitation occurs from November through March. The mean annual air temperature is 39 to 48 degrees F (4 to 9 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is slightly to moderately dissected with surface streams and rivers. Wetlands occur in some depressional areas, adjacent to lakes and occur as narrow bands along the streams. Pend Oreille and numerous other lakes occur in this subsection.

The primary natural disturbance processes are wildfire, insect and disease epidemics, flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failures tend to occur. Human-caused disturbances include intensive timber harvest, rural and suburban development and agriculture.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, glaciated rolling uplands (eastern two thirds of subsection) and unglaciated rolling uplands (western one third).

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The outwash of some of the valleys are deep and coarse with no streams. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrands, Aquands, Aquepts, and Ochrepts. The dominant potential natural vegetation is Douglas fir, grand fir, western hemlock series and grass/willow/sedge riparian types.

The glaciated rolling uplands are located at low to mid elevations with dominant slope gradients of 10 to 50 percent. The major landform features include low to moderate relief hills with some mountains. The major soils are deep, weakly weathered and have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Sandy loam, fine sandy loam,

or silt loam, subsoil textures are associated with soils underlain by quartzite, siltite and argillite. Sandy loams and loamy sand, subsoil textures are associated with soils underlain by granite and granodiorite. Subsoils contain 20 to 85 percent rock fragments. Some of the glaciated tills can have dense, impermeable layers within the soil profile. The major soils are Typic Udivitrands and Andic Dystrachrepts. The dominant potential natural vegetation is western hemlock, grand fir and Douglas fir series.

The unglaciated rolling uplands are located at low to mid elevations with dominant slope gradients of 10 to 70 percent. The major landform features include low to moderate relief hills and mountains, stream breaklands, and ridges comprised of colluvium and residuum. The major soils are deep, weakly to moderately weathered and have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Sandy loam, fine sandy loam, loam, or silt loam, subsoil textures are associated with soils underlain by quartzite, siltite and argillite. Sandy loams and loamy sand, subsoil textures are associated with soils underlain by granite and granodiorite. Subsoils contain 10 to 85 percent rock fragments. The major soils are Typic Udivitrands, Andic Dystrachrepts and Alfic Udivitrands. The dominant potential natural vegetation is western hemlock, grand fir and Douglas fir.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Ab Eastern Selkirk Mountains

Location: This subsection is located in the Kootenai and Pack River Basins of northern Idaho.

Subsection Concept: This subsection consists of continentally glaciated mountains of cretaceous Kaniksu batholith bedrock, which includes primarily granite, granodiorite and quartz monzonite. This subsection also has inclusions of metamorphic gneisses, schists and quartzites along the eastern edge of the area. Continental glaciation, alpine glaciation at the highest elevations on north and east aspects and fluvial processes make up the dominant land-forming processes. Mesic coniferous forests and subalpine forest at the higher elevations dominate the landscapes. This map unit is separated from similar subsections based on continental and alpine glaciation of primarily Kaniksu batholith.

Subsection Setting and General Characteristics: These continental and alpine glaciated mountains have an elevation range of 1800 to 7700 feet (549 to 2347 meters). The dominant slope range is 20 to 65 percent. The dominant types of rocks are granites, granodiorite and quartz monzonite. The primary geomorphic process in these landscapes is continental and alpine glaciation, stream incision and slope erosion.

Mean annual precipitation ranges from 30 inches/76 cms at the lowest elevations to 70 inches/178 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events frequently occur in this subsection. The mean annual air temperature is 29 to 47 degrees F (-2 to 8 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately dissected with surface streams and rivers, some landscapes contain many small 1st order drainages resulting from compacted tills perching subsurface water. Wetlands occur as narrow bands along the streams, in some depressional areas and cirque basins. Many lakes occur in the high elevation cirque basins.

The primary natural disturbance processes are wildfire; insect and disease epidemics; flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failures tend to occur. Human-caused disturbances include intensive timber harvest, cattle grazing and some mining.

Subsection Ecological Relationships:

This subsection has a repeating pattern of four primary landscape settings. These include stream bottoms and wet meadows, stream breaklands, continentally glaciated mountain slopes and high elevation, alpine glaciated landscapes.

The stream bottoms and wet meadows are located from low to high elevations, with slopes from 1 to 35 percent. These landscapes include trough bottoms and toeslopes, poorly drained alluvial lands, marshes, ponds and bogs. The soils are undifferentiated, properties vary with drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit, the major suborder classification is as follows: Umbrepts, Aquands, Cryands, Aquepts, Fluvents, Ochrepts, Saprists and Vitrandis. The dominant potential natural vegetation is western hemlock, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The stream breaklands are located at low to mid elevations on the very eastern edge of this subsection where streams flowing out of the Selkirk mountains are

actively downcutting to reach the level of the Kootenai river valley. Dominant slope gradients are 55 to 80 percent. The major landform features consist of V-shaped breaklands with streams in the bottom. The major soils are deep and have silt loam surface layers 7 to 14 inches thick, derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Underlying the ash is a variety of unconsolidated tills or lacustrine materials which vary in their textures and rock fragment contents. The dominant potential natural vegetation is western hemlock, western redcedar and Douglas fir series.

The continentally glaciated mountain slopes consist of ridges and sideslopes with dominant slope gradients of 20 to 55 percent. The major landform features consist of dissected and non-dissected mountain sideslopes and ridges comprised of glacially scoured and till deposition areas. The major soils on the ridges and well drained sideslopes range from shallow to deep, but are predominantly deep. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Most soils have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Sandy loam, loamy sand and sand subsoil textures are associated with soils underlain by granitic tills. Subsoils contain 10 to 80 percent rock fragments. The major soils on the well drained sites are Andic Dystrichrepts, Vitric Udivitrands, Andic Cryochrepts, Vitric Haplocryands and Andic Xerochrepts, with Andic Cryumbrepts, Vitric Fulvicryands and Andic Fragiumbrepts occurring in the more poorly drained sites. The dominant potential natural vegetation is subalpine fir, western redcedar and western hemlock, with incidental occurrences of whitebark pine series.

The high elevation, alpine glaciated landscapes consist of glacial cirque headwalls, cirque basins, trough walls, glacially scoured and till deposited ridges and slopes, with dominant slope gradients of 10 to 100 percent. Some cirque headwalls, scoured trough walls and ridges are dominated by rock outcrop, talus and shallow soils. The major soils consist of a complex which include thick dark colored surface layers in depressional areas and thin dark colored surface layers on the better drained sites. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Soils on the better drained sites tend to be deep, friable, with permeable subsoils. Most soils have silt loam, volcanic ash surface layers which range from 7 to 20 inches thick. These surface ash layers are often mixed with underlying material and have rock fragment contents ranging from 10 to 50 percent. Subsoils tend to be sandy loams, loamy sands and sand and contain 10 to 80 percent rock fragments. The shallow soils are classified as Lithic Cryochrepts. The major soils on deep, well drained sites are Andic Cryochrepts, and Vitric Haplocryands, with Andic Cryumbrepts and Vitric Fulvicryands occurring in the deep, poorly drained sites. The dominant potential natural vegetation is subalpine fir, whitebark pine series, and grass/sedge wetlands.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Ac Purcell Trench

Location: This subsection is located in the upper Kootenai River Basin of northern Idaho.

Subsection Concept: This subsection consists of a wide structural valley bottom made up of primarily lacustrine flats and terraces, floodplains and inclusions of sand dunes. Glacial lake deposition, glacial meltwater and stream erosion has been the dominant land-forming process. The major general vegetative type consists of coniferous forest. This map unit is separated from similar subsections based on landscapes that are nearly level and consisting primarily of lacustrine flats and terraces.

Subsection Setting and General Characteristics: These lacustrine flats and terraces have an elevation range of 1750 to 3000 feet (533 to 914 meters). Slopes are generally less than 10 percent with some steeper escarpments. The primary geomorphic processes creating this wide valley trench include faulting, continental glaciation, glacial lake deposition and fluvial processes.

Mean annual precipitation ranges from 20 inches/51 cms at the lowest elevations to 40 inches/102 cms at the highest elevations. Most of the precipitation occurs from November through March. The mean annual air temperature is 42 to 45 degrees F (6 to 8 degrees C).

The characteristic surface water features associated with this subsection include rivers, streams and wetlands. Typically the landscape is moderately dissected with surface streams and the Kootenai river. Wetlands are scattered throughout this subsection and occur as narrow bands along the streams and river. These waters support the most diverse fish community including the endangered white sturgeon.

The primary natural disturbance processes are wildfire, and insect epidemics. Due to the flat nature of this subsection its primary use is for urban and rural home sites and agriculture, primarily small grains, hay and hops.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting - Lacustrine flats and terraces, which includes low terraces and high terraces.

The lacustrine plains have dominant slope gradients of 0 to 10 percent. The primary soils are very deep, moderately well drained and poorly drained, very deep silty clay loams and silt loams. These soils are classified as Aquic and Dystric Xerochrepts, Typic and Psammentic Haploxeralfs, Typic Fluvaquents and Eutric Glossoboralfs. The dominant potential natural vegetation is Douglas fir, grand fir and western hemlock series.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Ad Rathdrum Prairie

Location: This subsection is located mainly in the upper Spokane River Basin of northern Idaho and extends a short distance into northeast Washington.

Subsection Concept: This subsection consists of an outwash plain derived from granitic and belt materials. Floodwaters and glacial meltwater has been the dominant land-forming process. The major general vegetative types include coniferous forest and grassland. This map unit is separated from similar subsections based on the landscape being near level and the outwash plain being made up of coarse outwash material derived from mixed geology.

Subsection Setting and General Characteristics: These outwash plains have an elevation range of 2000 to 2600 feet (609 to 792 meters). Slopes are generally less than 10 percent, steeper on moraines and terrace escarpments. The primary geomorphic processes creating this outwash plain involves glacial Lake Missoula floodwaters and glacial meltwaters.

Mean annual precipitation ranges from 20 inches/51 cms at the lowest elevations to 28 inches/71 cms at the highest elevations. Most of the precipitation occurs from November through March. The mean annual air temperature is 43 to 48 degrees F (6 to 9 degrees C).

No surface water features are associated with this subsection because of the deep, very permeable, outwash materials. This deep outwash provides a very important groundwater aquifer.

The primary natural disturbance processes are wildfire, and insect epidemics. Due to the flat nature of this subsection its primary use is for urban and rural home sites and agriculture, primarily grass seed production, small grains, hay and pasture.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting - outwash Plain.

The outwash plains have dominant slope gradients of 0 to 10 percent. The primary soils are very deep, well drained soil that formed in loess and volcanic ash mixed with glacial outwash. The surface soils tend to be silt loam and the subsoils are generally very gravelly or very cobbly sandy loams or sands. These soils are classified as Andic Xerochrepts, Andic Xerumbrepts, Typic Haploxerolls and Typic Xerochrepts. The dominant potential natural vegetation is ponderosa pine, Douglas fir and grand fir series.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Ae Western Selkirk Mountains

Location: This subsection is located in northeast Washington and northern Idaho.

Subsection Concept: This subsection consists of continentally and alpine glaciated mountains formed by a complex of major geologic structures which includes: Cretaceous Kaniksu batholith bedrock, which consists of granite, granodiorite and quartz monzonite; Precambrian metasedimentary bedrock, which consists of quartzites, siltites, and argillites. Where metasedimentary rocks have come in contact with intrusions of sills or Kaniksu batholith they have been altered to schists, amphibolites, phyllites and other metamorphic rocks. Rocks associated with sills include quartz diorite, metabase and gabbro. The Shedroof conglomerate and Leola volcanics formations occur around the Salmo-Priest Wilderness area. In Washington Maitlen phyllite, Addy quartzite, Gypsey quartzite, and the Three Sisters formation and metasediments of the Monk formation occur. Continental glaciation, alpine glaciation at the highest elevations on north and east aspects and fluvial processes make up the dominant land-forming processes. Mesic coniferous forests and subalpine forest at the higher elevations dominate the landscapes. This map unit is separated from similar subsections based on the complex mix of geology and subsequent mixed tills

Subsection Setting and General Characteristics: These continental and alpine glaciated mountains have an elevation range of 2000 to 7572 feet (610 to 2308 meters). The dominant slope range is 20 to 65 percent. The dominant types of rocks are batholith, belts and altered belts. The primary geomorphic process in these landscapes is continental and alpine glaciation, stream incision and slope erosion.

Mean annual precipitation ranges from 25 inches/64 cms at the lowest elevations to 70 inches/178 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events frequently occur in this subsection. The mean annual air temperature is 29 to 47 degrees F (-2 to 8 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately dissected with surface streams and rivers, some landscapes contain many small 1st order drainages resulting from compacted tills perching subsurface water. Wetlands occur as narrow bands along the streams, in some depressional areas and cirque basins. This subsection supports the large glacially formed Priest Lake known for its clarity and numerous cirque lakes.

The primary natural disturbance processes are wildfire; insect and disease epidemics; flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failures tend to occur. Human-caused disturbances include intensive timber harvest, cattle grazing and some mining.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include stream valleys and wet meadows, continentally glaciated mountain slopes and high elevation, alpine glaciated landscapes.

The stream valleys and wet meadows are located from low to high elevations, with slopes from 1 to 35 percent. These landscapes include trough bottoms and toeslopes, poorly drained alluvial lands, marshes, ponds and bogs. The soils are undifferentiated, properties vary with drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit, the major suborder classification is as follows: Umbrepts, Aquands,

Cryands, Aquepts, Fluvents, Ochrepts, Saprists and Vitrand. The dominant potential natural vegetation is western hemlock, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The continentally glaciated mountain slopes consist of ridges and sideslopes with dominant slope gradients of 20 to 55 percent. The major landform features consist of dissected and non-dissected mountain sideslopes and ridges comprised of glacially scoured and till deposition areas. The major soils on the ridges and well drained sideslopes range from shallow to deep, but are predominantly deep. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Most soils have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Sandy loam, loamy sand and sand subsoil textures are associated with soils underlain by granitic tills. Sandy loam, fine sandy loam, silt loam and loam subsoil textures are associated with soils underlain by belt tills. Subsoils contain 10 to 80 percent rock fragments. The major soils on the well drained sites are Andic Dystrichrepts, Vitric Udivitrands, Andic Cryochrepts, Vitric Haplocryands and Andic Xerochrepts, with Andic Cryumbrepts, Vitric Fulvicryands and Andic Fragiumbrepts occurring in the more poorly drained sites. The dominant potential natural vegetation is subalpine fir, western redcedar and western hemlock, with incidental occurrences of whitebark pine series.

The high elevation, alpine glaciated landscapes consist of glacial cirque headwalls, cirque basins, trough walls, glacially scoured and till deposited ridges and slopes, with dominant slope gradients of 10 to 100 percent. Some cirque headwalls, scoured trough walls and ridges are dominated by rock outcrop, talus and shallow soils. The major soils consist of a complex which include thick dark colored surface layers in depressional areas and thin dark colored surface layers on the better drained sites. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Soils on the better drained sites tend to be deep, friable, with permeable subsoils. Most soils have silt loam, volcanic ash surface layers which range from 7 to 20 inches thick. These surface ash layers are often mixed with underlying material and have rock fragment contents ranging from 10 to 50 percent. Subsoils associated with granitic tills tend to be sandy loams, loamy sands and sand. Subsoils associated with belt tills tend to be sandy loams, fine sandy loams, silt loams, or loams. Subsoils contain 10 to 80 percent rock fragments. The shallow soils are classified as Lithic Cryochrepts. The major soils on deep, well drained sites are Andic Cryochrepts, and Vitric Haplocryands, with Andic Cryumbrepts and Vitric Fulvicryands occurring in the deep, poorly drained sites. The dominant potential natural vegetation is subalpine fir, whitebark pine series, and grass/sedge wetlands.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Af Priest Lake - Pend Oreille Mountains

Location: This subsection is located in northern Idaho and northeast Washington.

Subsection Concept: This subsection consists of residual mountains of Precambrian metasedimentary bedrock, which includes primarily quartzites, siltites, and argillites; and Cretaceous Kaniksu Batholith which includes a mix of granite, granodiorite and quartz monzonite. This subsection also has inclusions of dacite and andesite flows along the western edge of the area. Stream valley incision and slope erosion, deposition, and frost churning make up the dominant land-forming processes. Mesic coniferous forests dominates the landscapes with some subalpine forest. This map unit is separated from similar subsections based on its mix of belt and granitic geology and that this subsection consists of moderate relief, weakly to moderately weathered residual mountains.

Subsection Setting and General Characteristics: These residual mountains have an elevation range of 2100 to 6300 feet (640 to 1920 meters). The dominant slope range is 20 to 60 percent. The dominant types of rocks are granite quartzite and siltite. The primary geomorphic process in these landscapes is stream incision and slope erosion, frost churning and associated mantle creep.

Mean annual precipitation ranges from 30 inches/76 cms at the lowest elevations to 50 inches/127 cms at the highest elevations. Most of the precipitation occurs from November through March, more than half of the precipitation falls as snow. The mean annual air temperature is 30 to 44 degrees F (-1 to 7 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, and wetlands. Typically the landscape is moderately dissected with surface streams and rivers. Wetlands occur as narrow bands along the streams and in depressional areas.

The primary natural disturbance processes are wildfire, insects and disease epidemics, flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failures tend to occur. Human-caused disturbances include intensive timber harvest, rural development and cattle grazing.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, dissected uplands, and high elevation, convex, mountain slopes.

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrandis, Aquands, Cryands, Aquepts, and Ochrepts. The dominant potential natural vegetation is grand fir, western redcedar, western hemlock, subalpine fir series and grass/willow/sedge riparian types.

The dissected uplands are located at low to mid elevations on the mountain slopes and ridges with dominant slope gradients of 10 to 70 percent. The major landform features consist of moderate relief, dissected and non dissected mountain slopes, stream breaklands, nivational hollows and ridges comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 7 to 20 inches thick

derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 45 percent rock fragments. Sandy loam, fine sandy loam, loam, or silt loam, subsoil textures are associated with soils underlain by quartzite, siltite and argillite. Sandy loams, loamy sands and sand subsoil textures are associated with soils underlain by granitics. Subsoils contain 15 to 85 percent rock fragments. The major soils on the well drained sites are Typic Udivitrands, Alfic Udivitrands and Andic Dystrochrepts with Humic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western hemlock, western redcedar, grand fir, and Douglas fir series.

The high elevation, convex, mountain slopes consist of ridges and sideslopes with dominant slope gradients of 10 to 60 percent. The major landform features consist of broadly convex ridges and mountain sideslopes comprised of colluvium and residuum, with inclusions glacial cirques and troughs. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 15 to 50 percent rock fragments. Sandy loam, fine sandy loam and silt loam subsoil textures are associated with soils underlain by quartzite and siltite. Sandy loams, loamy sands and sand subsoil textures are associated with soils underlain by granite. Subsoils contain 25 to 95 percent rock fragments. The major soils on the well drained sites are Vitric Haplocryands and Andic Cryochrepts, with Vitric Fulvicryands and Andic Cryumbrepts occurring in the more poorly drained sites. The dominant potential natural vegetation is subalpine fir with incidental occurrences of whitebark pine series.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Ag Kettle-Columbia River Interfluve

Location: This subsection is located between the Columbia and Kettle Rivers and the Canadian border in northeastern Washington.

Subsection Concept: This subsection consists of moderate-relief mountains of hard metavolcanic and metasedimentary rocks of the Kootenay Arc that have been modified by folding, faulting, continental glaciation and glacial outbreak flooding. The major vegetative types are mesic to dry coniferous forests. This map unit is separated from similar subsections based upon its unique mix of bedrock geology and the prevalence of deeply incised valleys influenced by glacial outbreak flooding.

Subsection Setting and General Characteristics: These mountains and their adjoining valleys range in elevation from 2000' to 5000'. The dominant slope range is 20-50%. Dominant rock types are metamorphosed Jurassic and Tertiary sedimentary rocks such as argillites, siltites, limestone and quartzite and metamorphosed igneous rocks, such as rhyolite, rhyodacite, monzonite and gneiss. The primary geomorphic processes operating in the current climate in these landscapes are hillslope erosion (creep) and stream channel erosion.

Mean annual precipitation ranges from 17" in the Columbia and Kettle River valleys to 35" in the higher mountains. Most precipitation occurs in the winter and spring, with an estimated 40% of the annual total falling as snow. The mean annual air temperature is 43 to 46 F.

The larger rivers are located in wide north-south trending valleys with extensive glaciofluvial deposits. Smaller streams are found in steep, confined valleys some of which were eroded during glacial outbreak flooding. The landscape is moderately dissected, and wetlands are not a prominent landscape feature except where beaver have flooded streamside areas. Pierre Lake, located in a glacially scoured north-south trending valley between very steep cliffs, is a distinguishing feature of this subsection.

The primary natural disturbance processes are fire, and flooding on the major rivers. Human-caused disturbances include early iron and magnetite open pit, and underground mining as well as gold dredging in several streams, channelization in Big Sheep Creek, stock grazing, logging, and dam construction.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings: continentally glaciated mountain slopes, wide valley bottoms with extensive glacial deposits, and steep, confined tributary valleys.

Valley Bottoms - Western hemlock, and western redcedar associations are dominant in riparian influence areas. Western redcedar and Douglas-fir associations are dominant in upland forested communities.

Continentally glaciated mountain slopes - Douglas-fir associations are dominant grading in to subalpine fir associations at higher elevations.

Confined tributary valleys - Vegetation in the setting is very similar to valley bottoms.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Ah Kettle Range

Location: This subsection is located in the Upper Columbia River basin, west of the Columbia River, east of the Republic Graben and south of the Canadian border in northeastern Washington.

Subsection Concept: This subsection consists of continentally glaciated mountains of gneiss and schist. Granodiorite and quartz monzonites underlying the higher elevations along the Kettle Crest were also glaciated, except for the highest peaks. The major vegetative types include mesic coniferous forest, dry open pine forests, and high elevation grass and sagelands. This map unit is separated from adjacent subsections based on geologic structure; it is a granitic dome with layered, metamorphosed roof rocks, bounded by the Kettle River fault on the east and the Sherman and Drummer Mountain faults on the west.

Subsection Setting and General Characteristics: These mountains range in elevation from 1400' at the Columbia and Kettle Rivers to 7130' on top of Copper Butte. The dominant slope range is 25% - 60%. Dominant rock types are Eocene and Cretaceous granites, quartz monzonites and monzodiorites, quartzites, marble and schist in the higher elevations, with pre-Tertiary granodiorite, phyllite, marble on the border zones of the dome. The primary geomorphic processes operating in the current climate in these landscapes are lateral stream channel erosion and soil creep.

Mean annual precipitation ranges from 17" in the Columbia and Kettle River valleys to 35" on the Kettle Crest. Most precipitation occurs in the winter and spring, with an estimated 40% of the annual total falling as snow. The mean annual air temperature is 37 to 46 F.

The larger streams tend to be located in moderately wide to confined valleys with deep fills of glaciofluvial materials. High glacial terraces are common. Smaller streams are found in steep, confined valleys. The landscape is moderately to very dissected. Wetlands are a prominent landscape feature only where beaver have flooded streamside areas. Trout Lake, in a narrow, glacially scoured valley between steep rock cliffs, and Lake Ellen are the only lakes of any size in this subsection. Small ponds are found on ridgetops in the vicinity of 13-mile Mt.

The primary natural disturbance processes are fire, and flooding on the major rivers. Human-caused disturbances include logging and early flume construction along Sherman Cr, stock grazing, lode mining and dam and highway construction.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings: continentally glaciated mountain slopes, valley bottoms of moderate width with deep glacial outwash and drift deposits, and high elevation steep mountain slopes along the Kettle Crest.

Valley Bottoms - Western redcedar and mesic subalpine fir associations, which include Englemann spruce, are dominant in riparian influence areas. Western hemlock associations are present in the northeast corner of this association, but drop out quickly moving south. Douglas-fir associations are dominant in forested communities, shrub and grass dominated communities occur on balds. The surface soils are generally volcanic ash influenced. Subsoil textures are mostly stony from glacial till parent material.

Continentally glaciated mountain slopes - Western redcedar associations dominate on north and east aspects. Douglas-fir associations are dominant on south and west aspects. Both grade into subalpine fir associations at higher elevations. Surface soils are volcanic ash influenced with subsoil textures varying from mostly shallow to deep, parent material on these slopes is

glacial till.

High Elevation Steep Mountain Slopes - subalpine fir and whitebark pine communities dominate. Douglas-fir/pinegrass may extend into this zone on steep southerly aspects with shallow soil profiles. Surface soils are generally volcanic ash influenced with subsoil textures varying from shallow stony to deeper. Parent material is igneous and metasedimentary rocks to a lesser extent glacial till.

Many of the subalpine associations are dominated by lodgepole pine after extensive burns in the early 1900's.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Ai Kalispell Mountains

Location: This subsection extends west from the Pend Oreille River valley into the Colville River basin in northeastern Washington.

Subsection Concept: This subsection consists of moderate-relief rounded mountains of granite and other acidic intrusive rocks that have been extensively modified by continental glaciation. The major vegetative types are mesic coniferous forests with some subalpine coniferous forests. This map unit is separated from similar subsections based upon its relatively homogeneous granitic parent material, extensive deposits of glacial drift, alluvium and talus and its rolling rather than mountainous topography.

Subsection Setting and General Characteristics: These mountains range in elevation from 1800' at the Pend Oreille River to 6800' on top of Calispell Peak. The dominant slope range is 25% - 55%. Dominant rock types are Cretaceous granodiorites, quartz monzonites and granites, and sandy glacial valley fills are very extensive. The primary geomorphic processes operating in the current climate in these landscapes are lateral stream channel erosion, soil creep, and debris slides on steep terrace escarpments.

Mean annual precipitation ranges from 15" in the Pend Oreille River valley to 45" at the highest elevations. Most precipitation occurs in the winter and spring. Depending on elevation, about 40%-60% of the annual total falls as snow. The mean annual air temperature is 43 to 47 F.

At the higher elevations, streams are often located in wide, flat valleys. They typically steepen toward the Pend Oreille River and most flow through deep, confined canyons along a short segment of their length. The landscape is moderately dissected. Wetlands are frequent, usually occurring in glacial outwash in association with moraine lakes or beaver meadows at the higher elevations. The Little Pend Oreille chain of kettle lakes is a notable feature of the subsection.

The primary natural disturbance process is fire. Human-caused disturbances include stock grazing, logging and flume construction, rural residential and recreational developments, and off road vehicle use.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings: continentally glaciated mountain slopes, gently sloping toeslopes and valleys with extensive glacial deposits, lakes and wetlands, and high elevation, frost-churned steep mountain slopes.

Continentally glaciated mountain slopes - Western hemlock and western redcedar series dominate. Grade into subalpine fir at higher elevations and Douglas-fir/grand fir association on lower southerly aspects.

Toeslopes and valleys with glacial deposits - upland associations are mainly dominated by western hemlock and western redcedar. These areas pool cold air and are frost prone.

High elevation frost churned mountain slopes - Subalpine fir associations dominate upper montane areas. Some subalpine vegetation is also present, such as on Calispell peak.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Aj Republic and Toroda Grabens

Location: This subsection is located in the Sanpoil and Kettle River basins, between the Columbia River and the Canadian border in northeastern Washington.

Subsection Concept: This subsection consists of volcanic and volcanoclastic sedimentary uplands bordering the structural master valleys. Both uplands and valleys have been modified by continental glaciation and preferential erosion has occurred along joints and faults. The major vegetative types include mesic coniferous forest, dry open pine forests, and open grasslands. This map unit is separated from adjacent subsections based on its geologic structure (graben) and volcanic lithology.

Subsection Setting and General Characteristics: The andesitic uplands vary in elevation from _____ in the north to _____ in the south, while the valley bottom elevations drop from _____ on the Kettle River to _____ where the Sanpoil meets the Columbia R. The dominant slope range is 25-50%, with cliffs greater than 80% bordering the Sanpoil River valley. Dominant rock type is andesite, with less extensive tuffs, breccias and volcanic conglomerates. Kame and outwash terraces with recent alluvial deposits dominate the valley bottoms. The primary geomorphic processes operating in the current climate in these landscapes are lateral stream channel erosion, soil creep, rock falls and shallow debris slides on steep slopes adjacent to streams, and sheet erosion on thin, gravelly soils located on grassy balds and ridges.

Mean annual precipitation ranges from 15" in the Sanpoil and Kettle River valleys to 35" on the Kettle Crest. Most precipitation occurs in the winter and spring, with an estimated 40-50% of the annual total falling as snow. The mean annual air temperature is 41 - 44F.

The larger streams are located in moderately wide valleys with ice-marginal and outwash terraces and recent alluvium. Kame terraces are common. Smaller streams flow in confined valleys deeply incised below the upland surface, and then frequently plunge through steep canyons to the master stream valleys. In the northernmost part of the subsection, the andesite upland surface is not present, and the terrain and geology are similar to that of the Kettle Dome subsection. The landscape is moderately dissected and the drainage network is controlled in some locations by joints and faults. Ponds perched on andesite bedrock are common.

The primary natural disturbance processes are fire, and flooding on the major rivers. Human-caused disturbances include logging, stock grazing, lode mining highway construction, rural residential development and some ranching in the valleys.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings: continentally glaciated mountain slopes, valley bottoms of moderate width with ice-marginal and outwash deposits, and steep and very steep slopes and cliffs bordering the master stream valleys.

Valley bottoms - Englemann spruce associations dominate with inclusions of subalpine fir. Wetter Douglas-fir associations are present outside of riparian areas.

Mountain slopes - Douglas-fir associations dominate. Ponderosa pine and non-forested associations are present on southerly aspects, balds, and areas with shallow soils. These grade into subalpine associations at higher elevations.

Steep slopes and cliffs - Ponderosa pine and ponderosa pine/Douglas-fir associations dominate forested sites. Shrub and grass dominated communities

are also prevalent on cliff and balds with soils insufficient to support forested communities.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Ak Okanogan Dome

Location: This subsection is located in the Columbia River Basin of Northeastern Washington state.

Subsection Concept: This subsection consists of the valley bottoms, rolling foothills, and glacial uplands of the Tertiary, Cretaceous and Quaternary periods in the Tonasket highlands. The valley floor and terraces are comprised of glacial till and outwash plains, lacustrine deposits, and glacio-fluvial deposits and alluvium, overlain by deep volcanic ash deposits. The material is of mixed origin that has been modified by glacial, fluvial, and alluvial geomorphic processes. The major vegetative types include Douglas Fir, grass and shrublands at the lower elevations and more southerly aspects. Subalpine fir, Larch and Lodgepole Pine occur at the moist, higher elevations. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors. Adjacent subsections to the west are broad valley bottoms and foothills at lower elevations. Thick volcanic ash deposits dominate most of the landscape except on the more exposed, open, and steeper southerly aspects.

Subsection Setting and General Characteristics: These valley bottoms, rolling foothills, and glacial uplands have an elevation range of 1200 to 7250 feet/360 to 2210 meters. The dominant slope range is 5 to 65 percent. The dominant types of geologic materials are Pretertiary Metamorphic Rocks that includes orthogneiss, banded gneiss and schist; Tertiary and Cretaceous Acidic Intrusive rocks that includes biotite, granite, and granodiorite; Unconsolidated Quaternary Sediments that includes drift deposits of the cordilleran ice sheet. The valley floor and foothills are comprised of glacial till, outwash plains and alluvium. Thick volcanic ash deposits or volcanic ash mixed with glacial material are found on the surface of most of this area. The primary geomorphic process(es) in these landscapes are glacial, fluvial, and alluvial.

Mean annual precipitation ranges from 15 inches/38 cms at the valley bottom to 40 inches/102 cms at the higher elevations. Most precipitation occurs in the winter season with 60 percent of the precipitation falling as snow and 20 percent falling in June as rain. The mean annual air temperature is 40 to 44 degrees F. (4.5 to 6.5 degrees C.)

The Bonaparte Creek, Lost Creek, and Omak Creek are the main stream systems within this area. Wetlands occur mainly in the valley floor and are associated with these three stream systems and also includes Toroda Creek and the Aeneas Valley. Omak Lake, Lost Lake, and Bonaparte Lake are the largest lakes within this area. Numerous smaller lakes and reservoirs occur at higher elevations in tributaries to the main stream systems.

The primary natural disturbance processes are fire, flooding, and slope failures. Fire intensity is lower at the higher elevations due to lighter fuels. Insect and disease problems (such as Pine Bark Beetle, Spruce Bud Worm, Misteltoe, and root Rot) occur over more than 50 percent of the forested lands. Several large debris avalanches exist on Bonaparte Mountain. Human-caused disturbances include logging, farming, and grazing along with some limited mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include valley bottoms, rolling foothills, and glacial uplands

The valley bottoms are located on the lower elevation sites with dominant slope gradients from 1 to 15 percent. These landscapes include floodplains, benches, terraces, and meadow landforms that are formed in glacial till, outwash plains and alluvium. The primary soils are deep (greater than 40 inches to bedrock) with textures of sandy loam, loam, and silt loam. These

soils are classified as Fluvaquentic Haplaquolls, Fluventic Haploxerolls, and aridic Haploxerolls. The dominant potential natural vegetation is Big Sage/Bluebunch wheatgrass and Aspen and Black Cottonwood vegetation in riparian habitats.

The rolling foothills are located above the valley floor at lower to mid elevation sites with dominant slope gradients from 10 to 45 percent. These landscapes include ridges, coulees, and hillslope landforms that are formed in glacial till and from sedimentary rock. The primary soils are moderately deep to deep with texture of sandy loam, loam, and silt loam. These soils are classified as Humic Vitrandepts, Calciorthidic Haploxerolls, Vitrandic Haploxerolls, and Typic Haploxerolls. The dominant potential natural vegetation is Three Tip Sagebrush/Idaho Fescue, Ponderosa Pine on the drier sites and to a limited extent, Douglas Fir on the more moist sites.

The glacial uplands are the most dominantly occurring of the landscape settings and are located on mid to high elevation sites with dominant slope gradients from 15 to 65 percent. These landscapes appear as more subdued or low relief glaciated hillslopes and mountain slopes that include glacial moraines, glacial-fluvial outwash terraces, lacustrine terraces, ridges, and small meadows. They are formed in stratified fluvial deposits of sands and gravels, glacial tills, volcanic ash, and some wind deposited glacial sands. These soils are generally deep, very gravelly sandy loams or loamy sands, gravelly sandy loams, and very fine to fine sandy loams. A hard pan layer can generally be found under many till deposits. These soils are classified as Andic Xerochrepts, Typic vitrixerands, Xeric Vitricryands, and Andic Cryochrepts. The dominant potential natural vegetation is Douglas fir, grasses and shrubs on the more open drier sites and Subalpine fir, Larch and Lodgepole Pine on the more moist sites.

Compiled By: Kenneth J. Radek, Okanogan National Forest

M333Am Keller Hills

Location: This subsection is located north of the Columbia River between the mouth of the Spokane River and Grand Coulee Dam in northeastern Washington.

Subsection Concept: This subsection consists of low relief granitic hills mostly north of the Columbia River, that have been modified by faulting and, more extensively by deposition associated with the Lake Missoula outbreak floods. The major vegetative types include dry coniferous forest, dry open pine forests, and open grasslands. This map unit is separated from adjacent subsections based on its granitic lithology and the extensive depositional landforms along the river.

Subsection Setting and General Characteristics: These hills range in elevation from approximately 1600' along the Columbia River to about 4800' at Keller Butte Lookout. The dominant slope range is 0 % to 65 %. The dominant rocks are Tertiary-age granites and other acidic intrusive rocks, which in some areas are extensively intruded by dike swarms. The primary geomorphic processes operating in the current climate in these landscapes are lateral stream channel erosion and debris slides on steep fine-grained terrace escarpments adjacent to the Sanpoil and Columbia Rivers.

Mean annual precipitation ranges from 15" to 25" in the higher elevations. Most of the precipitation occurs in the winter and spring, with an estimated 20%(?) of the annual total falling as snow. The mean annual air temperature is 42 - 44F.

The Sanpoil and Columbia Rivers are located in wide valleys with high glacial terraces of coarse outbreak flood deposits and fine glaciolacustrine material, and moderately dissected unglaciated granitic hills.

The primary natural disturbance processes are fire, and flooding on the major rivers. Human-caused disturbances include logging, stock grazing, agriculture on the valley terraces, rural residential development and the Grand Coulee Dam.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings: residual (unglaciated) mountain slopes, wide valleys edged by high glaciolacustrine and outwash terraces, and flood basalt

Ponderosa pine and Douglas-fir associations dominate this subsection.

Comment: Not much information was available for use in this project. Colville confederated Tribes is assumed to have better information on landscape settings, and potential vegetation in this subsection.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Ao Huckleberry Range

Location: This subsection is located adjacent to the Columbia River in southern Ferry and Stevens Counties in northeast Washington. It includes the Huckleberry Range on the east side of the Columbia River, and a similar area on the west side of the river.

Subsection Concept: This subsection consists of mountains and foothills underlain mostly by a complex mixture of Ordovician-aged marine metasedimentary and metavolcanic rocks. Some of the types of rocks found there include meta-wacke, metaconglomerate, quartzite, phyllite and metargillite. A smaller amount of Cretaceous granitic rocks occur, mostly in the southeast portion of the subsection. The higher elevation landscapes are residual and the lower areas are covered with glacial till. The surface has a mantle of loess and volcanic ash. Stream dissection and glacial deposition are the dominant land-forming processes. Mesic coniferous forests dominate the landscape. This map unit is separated from similar subsections based on the presence of the metasedimentary and metavolcanic rocks, and mountain and foothill landforms. Surrounding subsections generally have other types of geologic materials or landforms.

Subsection Setting and General Characteristics: These mountains and foothills have an elevation range of 1800 to 6000 feet (549 to 1829 meters). The slope range is from 0 to 65 percent. The dominant types of rocks are metasedimentary and metavolcanic with smaller amounts of granitics. The primary geomorphic processes in these landscapes are stream incision and lower elevation glacial deposition.

Mean annual precipitation ranges from 15 inches (38 cms) at the lowest elevations to 45 inches (113 cms) at the highest elevations. Precipitation is lowest during July and August and highest in December and January. The mean annual air temperature is 43 to 47 degrees F (6 to 8 degrees C).

The surface water features associated with this subsection include streams and wetlands. The streams generally flow directly into the Columbia or Colville Rivers. Drainageways in the mountainous areas are deeply dissected. Wetlands occur in smaller amounts generally as narrow bands along streams and in depressional areas.

The primary natural disturbance process is wildfire. Human-caused disturbances are mainly associated with timber harvesting.

Subsection Ecological Relationships:

This subsection has two primary landscape settings: mountains and foothills.

The mountains are located at low to mid-elevations with slope gradients of 0 to 65 percent. These mountains consist of rounded ridgetops and smooth mountain toe slopes, and sharp ridgetops and steep, smooth footslopes and sideslopes. These are formed in material weathered from metasedimentary and metavolcanic rocks with smaller areas of granitics. These materials have a surface mantle of loess and volcanic ash. The major soils are moderately deep and well drained. Surface textures are generally loams, very fine sandy loams and silt loams. Subsoil and substratum textures are silt loams, loams and sandy loams with some gravelly, shaly, very shaly, very flaggy and extremely flaggy horizons. The major soils are classified as Andic Xerochrepts, Ultic and Entic Ultic Haploxerolls and Entic Cryandeps. The dominant potential natural vegetation is the grand fir and Douglas-fir series.

The foothills occur at low to mid-elevations with slope gradients of 0 to 65 percent. The foothills are comprised of glacial till, residuum and colluvium with a mantle of loess and volcanic ash. The major soils are moderately deep to very deep and well drained. Surface textures are generally silt loams and loams. Subsoil and substratum textures are mostly loams, sandy loams, clay

loams and silt loams with some gravelly and very gravelly horizons. The major soils are classified as Andic and Typic Xerochrepts, Typic and Pachic Haploxerolls, Typic Argixerolls and Mollic Palexeralfs. The dominant potential natural vegetation is the grand fir and Douglas-fir series.

Compiled By: Gary Ford, U. S. Forest Service (Source: Soil Survey of Stevens County, Washington)

M333Aq Calispell Mountains

Location: This subsection includes the mountains extending from the Pend Oreille River south and west to the Colville and Spokane River valleys in northeastern Washington.

Subsection Concept: This subsection consists of moderate-relief mountains of metasedimentary Belt rocks and Eocene granitic rocks, with inclusions of Kaniksu batholith granitic rocks. All but the highest elevations were modified by continental glaciation, and the Belt rocks are intensely faulted. The dominant vegetative types are mesic to dry coniferous forests. This map unit is separated from similar subsections based upon its diverse mix of resistant bedrock geologies and its relatively precipitous topography.

Subsection Setting and General Characteristics: These mountains range from 2000' at the edge of the Pend Oreille River valley, to 5740' on Chewelah Mt. The dominant slope range is 20-50%. Dominant rock types in the northern part of the subsection are faulted and metamorphosed preCambrian sedimentary rocks such as quartzites, phyllites, metargillites and dolomites. To the south, tertiary and cretaceous granitic rocks are prominent. The primary geomorphic processes operating in the current climate in these landscapes are lateral stream channel erosion and soil creep.

Mean annual precipitation ranges from 20" in the Pend Oreille and Spokane River valleys to 45" in the highest elevations. Most precipitation occurs in the winter and spring, with an estimated 40%-60% of the annual total falling as snow, depending on the elevation. The mean annual air temperature is 39 to 44 F.

Streams are located in deeply incised valleys, with at least some glacial drift filling the valley bottom. At the edge of the subunit which borders the Colville-Chamokane and Pend Oreille valleys, these tributaries frequently open into wide valley areas with extensive glaciofluvial deposits. The landscape is moderately dissected, and wetlands are not a prominent landscape feature in the north part of the subsection except where beaver have flooded streamside areas. Loon Lake and Deer Lake, two large moraine lakes near the edge of the Colville-Chamokane valley are notable features of this subsection.

The primary natural disturbance process is fire. Human-caused disturbances include agriculture, stock grazing, logging and extensive exurban development especially around the lakes.

Subsection Ecological Relationships:

This subsection consists of five primary landscape settings: rolling forested foothills and uplands, continentally glaciated mountain slopes, high elevation, unglaciated, frost-churned mountain slopes, and glacial depositional landforms in valleys.

Rolling forested foothills and uplands - grand fir dominates (?) with Douglas-fir associations increasing to the south of the subsection. Western redcedar associations found in draws and near wetlands.

Continentally glaciated mountain slopes - western redcedar/western hemlock associations dominate on northerly aspects. Grand fir and Douglas-fir associations more prevalent on southerly aspects, although western redcedar is found in draws and moist areas.

High elevation frost churned mountain slopes - Subalpine associations dominate with some western hemlock/western redcedar in more moist draws.

Glacial depositional landforms in valleys - Western hemlock and western redcedar association dominate.

Deeply incised valleys (east slopes) - Western hemlock and western redcedar association dominate.

Compiled by: Kim Lu Clarkin, Paula Barreras, Jay Berube and Bernard Kovalchik, Colville National Forest

M333Ar Colville-Little Spokane River Valleys

Location: This subsection is located in Pend Oreille and Stevens Counties in northeast Washington.

Subsection Concept: This subsection includes the wide valleys adjacent to the Colville and Little Spokane Rivers. It also includes the narrow valleys adjacent to the Pend Oreille and Columbia Rivers. These valleys are underlain by igneous, sedimentary and metamorphic rocks and have been modified by glacial and fluvial processes. The major vegetative type is forest. This unit is separated from adjacent ones because of its lower elevation valley topography and alluvial materials.

Subsection setting and general characteristics: These valleys have an elevation range of 1400 to 4000 feet (427 to 1219 meters). The dominant slope range is 0 to 65 percent on the terraces and 0 to 3 percent on the flood plains. A number of different rock types occur within the area. Precambrian aged sandstones, argillites, limestones, slate, quartzites and dolomites, and Mesozoic granitics occur. Pliocene nonmarine rocks (conglomerate, sandstone, shale and mudstones) occur near the Columbia River. The dominant types of surficial material are alluvium and glacial outwash. The primary geomorphic processes in these landscapes is fluvial and glacial.

Mean annual precipitation ranges from 15 to 35 inches (38 to 88 cms). Most snow occurs between November and February. The mean annual air temperature is 43 to 47 degrees F (6 to 8 degrees C).

Streams in the area include the Columbia River and some of its tributaries: the Colville River, Little Spokane River and the Pend Oreille River.

The primary natural disturbance processes have been glaciation and flooding. Human-caused disturbances are associated with irrigated and non-irrigated agriculture in the wider valleys. Conversion of riparian forests, shrubland and meadows to pastureland is common.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings: flood plains and terraces.

The flood plains are located on low elevation sites with dominant slope gradients of 0 to 3 percent. These landscapes include stream channels, and flood plains with some lake basins that are formed in alluvium, alluvium formed from ash and small areas of muck. The primary soils are very deep to bedrock and range from moderately well drained to very poorly drained. The surface soil is mainly a loam or silt loam texture. Subsoils and substratums are silt loam, silty clay loams, loams and sandy loams. The major soils are classified as Cumulic and fluvaquentic Haploxerolls, Histic Vitraquands, Fluvaquentic Haplaquolls, and Andaqueptic Fluvaquents. The dominant potential natural vegetation consists of ponderosa pine and Douglas-fir series. Some wet meadows and alkali bottoms also occur.

The terraces are located on low elevation sites with dominant slope gradients of 0 to 65 percent. These landscapes include the nearly level to sloping terrace tops, the moderately steep to steep terrace escarpments and some basins. These have formed in older alluvium and glacial outwash. The primary soils are very deep to bedrock and are somewhat excessively drained to somewhat poorly drained. The surface textures are usually sandy loams, sands and silty clay loams. Subsoils and substratums are silty clays, silt loams, sandy loams, sands and loams. The major soils are classified as Aquic and Andic Haploxeralfs, Andic Palexeralfs, Typic Vitrixerands, Vitrandic, Typic and Andic Xerochrepts, Typic Xerorthents and Typic Xeropsamments. The dominant potential natural vegetation consists of ponderosa pine, Douglas-fir and grand fir series.

Compiled by: Gary Ford, U.S. Forest Service (Source: Soil surveys of Pend Oreille and Stevens Counties, Washington)

M333As Okanogan/Methow Lowlands

Location: This subsection is located in the Columbia River Basin of Northeastern Washington state.

Subsection Concept: This subsection consists of the broad valley floor, glacial stream terraces, and foothills of the Okanogan River drainage that occur over Cretaceous/Jurassic Sedimentary rocks. The valley floor, terraces, and foothills are comprised of glacial till, outwash plains and of localized alluvium deposits. The material is of mixed origin that has been modified by glacial, fluvial, and alluvial geomorphic processes. The major general vegetative types include Big Sage/Bluebunch Wheatgrass along the valley bottoms and lower foothills, and Three Tip Sagebrush/Idaho Fescue dominates the higher elevations in the foothills and tributary valleys. Ponderosa Pine woodlands and forests mark the transition to higher elevations. This map unit is separated from similar subsections based upon geologic structure, parent material, and climatic/vegetative factors. Adjacent subsections to the west are steeper, higher elevation, and more highly dissected mountains while the subsection to the east is mostly mid-elevation foothills and subdued mountain slopes that are highly volcanic ash influenced on the soil surface.

Subsection Setting and General Characteristics: These foothills, terraces and broad valley floor have an elevation range of 800 to 4000 feet/240 to 1230 meters. The dominant slope range is 1 to 45 percent. The dominant types of geologic materials are sedimentary and volcanic rocks that are overlain by extensive deposits of glacial till and outwash plains. Mixed alluvium has reworked many of the glacial deposits and to some extent, some volcanic ash deposits can also be found mixed in with the glacial material. The primary geomorphic process(es) in these landscapes are glacial, fluvial, and alluvial.

Mean annual precipitation ranges from 9 inches/23 cms at the valley bottom to 20 inches/51 cms at the higher elevations. Most precipitation occurs in the winter season with 60 percent of the precipitation falling as snow and 20 percent falling in June as rain. The mean annual air temperature is 47 to 51 degrees F. (8-11 degrees C.)

The Okanogan River and Similkameen River are the main stream systems within this area. Wetlands occur mainly in the valley floor and are associated with the Okanogan and Similkameen River systems. Palmer Lake and Okanogan Lake are the largest lakes within this area and occur within the main river channels. Numerous smaller lakes and reservoirs, such as Spectacle Lake, Blue Lake, Wannacut Lake and Aeneas Lake occur at higher elevations in tributaries to the main river systems. Natural wetlands also occur in the valley floor adjacent to both rivers.

The primary natural disturbance processes are fire, flooding, and slope failures. Human-caused disturbances include orchards, farming, grazing, and urban/rural development, along with some limited logging and mining

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include broad valley bottoms, terraces and rolling foothills.

The broad valley bottoms are located on the lower elevation sites with dominant slope gradients from 1 to 15 percent. These landscapes include floodplains, bench, and meadow landforms that are formed in glacial till, outwash plains and alluvium. The primary soils are deep (greater than 40 inches to bedrock) with textures of sandy loam and loam. These soils are classified as Fluvaquentic Haplaquolls, Fluventic Haploxerolls, and Aridic Haploxerolls. The dominant potential natural vegetation is Big Sage/Bluebunch wheatgrass, Aspen and Black Cottonwood vegetation in riparian habitats.

The glacial terraces are located above the main valley floors on low to mid

elevation sites with slopes from 1 to 15 percent. These landscapes include terraces and floodplain landforms. They are formed in stratified fluvial deposits of gravels, fine sands, or silts. The primary soils are deep, sandy loams, silt loams and extremely stony sandy loams. These soils are classified as Aridic Haploxerolls and Lithic Xerochrepts. The dominant potential natural vegetation is Big/Sage/Bluebunch wheatgrass.

The rolling foothills are located on both sides of the valley floor at higher elevation sites with dominant slope gradients from 10 to 45 percent. These landscapes include ridges, rolling hills, coulees, and some limited glaciated mountain slope landforms that are formed in glacial till and from sedimentary rock. The primary soils are moderately deep to deep with texture of sandy loam, loam, and silt loam. These soils are classified as Vitrandic Haploxerolls, Calciorthidic haploxerolls, Aridic Haploxerolls, and Typic Haploxerolls. The dominant potential natural vegetation is Three Tip Sagegruch/Idaho Fescue, and Ponderosa Pine on the drier sites. To a limited extent, Douglas Fir occurs on the more moist sites.

Compiled By: Kenneth J. Radek, Okanogan National Forest

M333Ba Cabinet and Purcell Mountains

Location: This subsection is located in the Kootenai and Pack River Basins of northern Idaho.

Subsection Concept: This subsection consists of continentally and alpine glaciated mountains of Precambrian metasedimentary bedrock, which includes primarily quartzites, siltites, and argillites. This subsection also has inclusions of quartz diorite, gabbro and metadiorite associated with sills, and granitic intrusions. Continental glaciation, alpine glaciation at the highest elevations on north and east aspects and fluvial processes make up the dominant land-forming processes. Mesic coniferous forests and subalpine forest at the higher elevations dominate the landscapes. This map unit is separated from similar subsections based on the dominance of belt tills.

Subsection Setting and General Characteristics: These continental and alpine glaciated mountains have an elevation range of 1800 to 7700 feet (549 to 2347 meters). The dominant slope range is 20 to 65 percent. The dominant types of rocks are belts. The primary geomorphic process in these landscapes is continental and alpine glaciation, stream incision and slope erosion.

Mean annual precipitation ranges from 25 inches/64 cms at the lowest elevations to 70 inches/178 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events frequently occur in this subsection. The mean annual air temperature is 30 to 45 degrees F (-1 to 7 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately dissected with surface streams and rivers, some landscapes contain many small 1st order drainages resulting from compacted tills perching subsurface water. Wetlands occur as narrow bands along the streams, and in some depressional areas and cirque basins. This subsection has numerous low and high elevation lakes.

The primary natural disturbance processes are wildfire; insect and disease epidemics; flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failures tend to occur. Human-caused disturbances include intensive timber harvest, cattle grazing and some mining.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include stream valleys and wet meadows, continentally glaciated mountain slopes and high elevation, alpine glaciated landscapes.

The stream valleys and wet meadows are located from low to high elevations, with slopes from 1 to 35 percent. These landscapes include trough bottoms and toeslopes, poorly drained alluvial lands, marshes, ponds and bogs. The soils are undifferentiated, properties vary with drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit, the major suborder classification is as follows: Umbrepts, Aquands, Cryands, Aquepts, Fluvents, Ochrepts, Sapristis and Vitrandis. The dominant potential natural vegetation is western hemlock, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The continentally glaciated mountain slopes consist of ridges and sideslopes with dominant slope gradients of 20 to 55 percent. The major landform features consist of dissected and non-dissected mountain sideslopes and ridges comprised of glacially scoured and till deposition areas. The major soils on the ridges and well drained sideslopes range from shallow to deep, but are

predominantly deep. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Most soils have silt loam surface layers 7 to 20 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 50 percent rock fragments. Sandy loam, fine sandy loam, silt loam and loam subsoil textures are associated with soils underlain by belt tills. Sandy loam, loamy sand and sand subsoil textures are associated with the inclusions of granitic tills. Subsoils contain 10 to 80 percent rock fragments. The major soils on the well drained sites are Andic Dystrachrepts, Vitric Udivitrands, Andic Cryochrepts, Vitric Haplocryands and Andic Xerochrepts, with Andic Cryumbrepts, Vitric Fulvicryands and Andic Fragiumbrepts occurring in the more poorly drained sites. The dominant potential natural vegetation is subalpine fir, western redcedar and western hemlock, with incidental occurrences of whitebark pine series.

The high elevation, alpine glaciated landscapes consist of glacial cirque headwalls, cirque basins, trough walls, glacially scoured and till deposited ridges and slopes, with dominant slope gradients of 10 to 100 percent. Some cirque headwalls, scoured trough walls and ridges are dominated by rock outcrop, talus and shallow soils. The major soils consist of a complex which include thick dark colored surface layers in depressional areas and thin dark colored surface layers on the better drained sites. Soils in depressional areas, and on wet slopes tend to be deep and have dense, brittle subsoils which perch ground water into the surface layers. Soils on the better drained sites tend to be deep, friable, with permeable subsoils. Most soils have silt loam, volcanic ash surface layers which range from 7 to 20 inches thick. These surface ash layers are often mixed with underlying material and have rock fragment contents ranging from 10 to 50 percent. Subsoils associated with belt tills tend to be sandy loams, fine sandy loams, silt loams, or loams. Subsoils associated with inclusions of granitic tills tend to be sandy loams, loamy sands and sand. Subsoils contain 10 to 80 percent rock fragments. The shallow soils are classified as Lithic Cryochrepts. The major soils on deep, well drained sites are Andic Cryochrepts, and Vitric Haplocryands, with Andic Cryumbrepts and Vitric Fulvicryands occurring in the deep, poorly drained sites. The dominant potential natural vegetation is subalpine fir, whitebark pine series, and grass/sedge wetlands.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Bb Purcell - Salish Mountains

Location: This subsection is located in the Little Bitterroot, Fisher, Thompson, Yaak, Tobacco, and Stillwater River Basins of northwestern Montana.

Subsection Concept: This subsection consists of anticlinal mountains of Precambrian metasedimentary bedrock that have been strongly shaped by continental glaciation. Subalpine and mesic coniferous forests dominates the landscapes. This map unit is separated from similar anticlinal mountains based upon climatic characteristics.

Subsection Setting and General Characteristics: These anticlinal folded mountains have an elevation range of 2500 to 7600 feet (760 to 2,315 meters). The slope range is 2 to 50 percent. The dominant lithology is Precambrian metasedimentary argillites, siltites, and dolomites. The primary geomorphic processes in these landscapes are glacial and fluvial erosion or deposition.

Mean annual precipitation ranges from 20 inches (51 cms) in the valley bottom to 50 inches (127 cms) at the mountain tops. Most precipitation occurs in the winter and spring months. Seventy percent of the precipitation falls as snow in the mountainous portion of the map unit. The mean annual air temperature is from 36 to 39 degrees F (2 to 4 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occurs in the valley bottom locations associated with lacustrine and alluvial deposits. Lakes occur in structurally controlled basins. Wetlands and lakes represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect epidemics, and wind throw. Human-caused disturbances include rural and suburban development along river terraces; and timber management throughout the subsection on forested sites.

Subsection Ecological Relationships:

This subsection has a repeating pattern of two primary landscape settings. These include valley bottom and upland landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include alluvial bottom, glacial outwash and lacustrine landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, silt loams and extremely gravelly sandy loams or loamy sands. These soils are classified as Dystric Eutrochrepts, Glossic Cryoboralfs, and Typic Udifluvents. The dominant potential natural vegetation is Douglas-fir, subalpine fir, and Engelmann spruce series.

The uplands are located on mid to high elevation sites with slopes from 10 to 50 percent. These landscapes include rolling glacial moraine and glacially scoured ridgetop landforms. The glacial moraines are formed in glacial till and volcanic ash parent materials. The ridgetops have residual bedrock and volcanic ash parent materials. The primary soils are deep to shallow, gravelly silt and sandy loams. These soils are classified as Andeptic Cryoboralfs, Typic Eutroboralfs, Dystric and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir, and Douglas-fir series.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Bc Flathead River Valley

Location: This subsection is located in the Flathead River Basin of northwestern Montana.

Subsection Concept: This subsection is an intermountain basin with surficial alluvial and glacial deposits of Pleistocene and Holocene age. A combination of coniferous forest, deciduous forest, and grassland vegetation dominates the landscapes. This subsection has no competing map units.

Subsection Setting and General Characteristics: This intermountain basin has an elevation range of 2,300 to 4,500 feet (700 to 1,370 meters). The slope range is 1 to 25 percent. The dominant lithology is Precambrian metasedimentary argillites, siltites, and dolomites. The primary geomorphic process in these landscapes is fluvial and glacial erosion or deposition.

Mean annual precipitation ranges from 14 inches (35 cm) in the valley bottom to 25 inches (64 cms) in the uplands. Most precipitation occurs in the winter and spring months. Fifty percent of the precipitation falls as snow in this map unit. The mean annual air temperature is from 36 to 44 degrees F (2 to 7 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands and lakes occurs in valley bottom locations associated with glacial-fluvial and alluvial deposits. Wetlands and lakes represent a major component of this subsection.

The primary natural disturbance processes are wildfire, and flood events. Human-caused disturbances significantly affect these landscapes. The human uses include agriculture production, forest management, rural and suburban development.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include alluvial bottoms and floodplains, stream terraces, and glacial uplands.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include stream terrace and floodplain landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, sandy loams, silt loams and extremely gravelly sandy loams. These soils are classified as Typic Eutrochrepts, Fluvaquentic Haploxerolls, and Typic Ustifluvents. The dominant potential natural forest vegetation is Ponderosa pine, Douglas-fir, and black cottonwood series. Moist grassland and shrubland vegetation are also a major component of this map unit.

The stream terraces are located on mid elevation sites with slopes from 2 to 15 percent. These landscapes include alluvial terrace and alluvial fan landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, gravelly silt/sandy loams and sandy loams. These soils are classified as Udic Haploborolls, Pachic Udic haploborolls, and Typic Ustipsamments. The dominant potential natural forest vegetation is Ponderosa pine, Douglas-fir, and black cottonwood series. Moist grassland and shrubland vegetation are also a major component of this map unit.

The glacial uplands are located on mid to high elevation sites, with the dominant slopes from 2 to 30 percent. These landscapes include glacial-fluvial outwash terrace, glacial moraine, lacustrine terrace, and sand dune landforms. That are formed in stratified fluvial deposits of sands and

gravels, glacial tills, or wind deposited glacial sands or volcanic ash. The primary soils are deep, extremely gravelly sandy loams, gravelly silt loams, and fine sandy loams. These soils are classified as Andic Ustochrepts, Typic Cryoboralfs, and Typic Ustipsamments. The dominant potential natural vegetation is Douglas-fir, Grand fir, and Ponderosa pine series, with intermingled mesic grasslands.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Be Cabinet Mountains

Location: This Subsection includes the east and west sections of the Cabinet Mountains. It is located in northwest Montana and northern Idaho. The northern portion of the area flows to the Kootenai River and southern flows to the Clark Fork of the Columbia River. The two mountain sections are separated by the Lake Creek/Bull River valley.

Concept: Erosional mountains of Precambrian metasedimentary bedrock, strongly modified by alpine glaciation. Subalpine and alpine environments dominate the upper elevations. Mesic environments dominate at the lower elevations. This Subsection is separated from the others in the Section by the dominance of alpine glacial features.

Setting and General Characteristics: These alpine glaciated landforms have an elevation range of 2100 to 8700 feet MSL/636 to 2636 meters. The dominant slope range is 20 to 80 with five to over 100 percent as extremes. The dominant lithology is Middle Proterozoic metasedimentary argillites, siltites, quartzites, and dolomites of the Belt Supergroup. The primary geomorphic processes are glacial and fluvial erosion.

Landforms are dominated by alpine glacial features with many slopes greater than 100 percent. Cirque headwalls and U-shape valleys are common. Lakes are present in most cirque basins. Slopes in the cirque basins and valley bottoms range from less than 10 to 40 percent. Continental glacial ice influenced the lower elevations. The west and southwest major ridges are typically frost-churned and rounded. The cirque basins are most commonly found on the northeasterly aspects.

Mean annual precipitation ranges from 25 inches (10 cms) in the main valley bottom to over 100 inches (39 cms) at the Cabinet crest. Most of the precipitation occurs in the winter and spring months. Seventy percent or more of the precipitation falls as snow in the upper elevations. Twenty to fifty percent falls as snow in the lower and mid elevations. Rain-on-snow events occur frequently and cause major flooding in most of the streams, which has major impacts on downstream areas. Mean annual air temperatures range from 20 to 40 degrees F/-7 to 4 degrees C. Air temperature extremes range from -35 to 100 degrees F/-37 to 38 degrees C.

The characteristic surface water features associated with this subsection include streams, rivers, lakes, and wetlands. Typically the landscape is weakly to moderately dissected with surface streams. Wetlands occur in the cirque basins, valley bottom locations associated with glacio-fluvial and alluvial deposits, and in some depressional areas. Lakes occur in the cirque basins and glacial valleys. Wetlands and lakes represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect epidemics, windthrow, and flooding. Human-caused disturbances include rural and suburban development in the major valley; timber management on the low to mid elevation forested slopes; and recreational camping and trails in the higher elevations, especially adjacent to cirque-basin lakes.

Ecological Relationships: This subsection has a repeating pattern of three primary landscape settings. These are valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on the lower elevation sites with slopes from three to 20 percent. These landscapes include alluvial bottom, glacial outwash, and lacustrine landforms. The primary soils are deep, glacio-fluvial, very gravelly sandy loams; deep silt loams; and moderately deep, very gravelly silt loams. These soils are classified as Fluvents, Typic Entrochrepts, Andic Dystrochrepts. The dominant potential natural vegetation are the western redcedar, western hemlock, and subalpine fir series.

The uplands are located on the low to mid elevation sites with slopes from 10 to 60 percent. These landscapes include glaciated mountain slopes and glacial moraines. These soils are forming in the underlying bedrock and glacial till with a surface deposit of volcanic ash. The primary soils are deep, very gravelly very fine sandy loams and moderately deep, very gravelly sandy loams. These soils are classified as Andic Dystrichrepts, Andic Cryochrepts, and Lithic Cryochrepts. The dominant potential natural vegetation are the western redcedar, western hemlock, and Douglas-fir series.

The subalpine and alpine landscapes are located on mid to high elevation sites. The dominant slopes are 40 to 80 percent. Ridgetop sites have slopes ranging from five to 30 percent. These landforms are characteristically cirque headwalls, cirque basins, alpine ridges and glacial troughwalls. These have been formed mostly in the residual bedrock and have a mantle of volcanic ash. The primary soils are shallow to moderately deep, very gravelly sandy loams and silt loams. They are classified as Lithic and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir series.

Compiled by: Kootenai National Forest; Louis J. Kuennen, Soil Scientist.

M333Bf Hot Springs Valley

Location: This subsection is located in the central part of western Montana and is part of the Columbia River Basin.

Subsection Concept: This subsection consists of dry, residual belt mountains, broad valley bottom and rolling foothills of quartzites, siltites and argillites from the precambrian Belts Formation. The valley floor and foothills are comprised of glacial till and outwash plains, Lake Missoula sediments and local alluvium. This material is of mixed origins that have been modified by glacial, colluvial, fluvial and alluvial geomorphic processes. The major general vegetative types include coniferous forest on the higher elevation with grass and shrublands on the lower elevation foothills and valley bottom. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. Adjacent subsections on the south, west and north are steeper, dissected mountains while the unit to the east is a broad valley.

Subsection Setting and General Characteristics: These residual belt mountains, broad valley bottom and rolling foothills have an elevation range of 2500 to 6500 feet/769 to 2000 meters. The dominant slope range is 0 to 80 percent. The dominant types of rocks are quartzites, siltites and argillites from the precambrian Belts Formation. The valley floor and foothills are comprised of glacial till and outwash plains, Lake Missoula sediments and local alluvium. The primary geomorphic processes in these landscapes are glacial, fluvial, colluvial and alluvial.

Mean annual precipitation ranges from 12 inches/30 cms in the valley bottom to 40 inches/102 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 60 percent of the precipitation falling as snow. The mean annual air temperature is 30 to 47 degrees F/-1 to 8 degrees C.

The Flathead River and the Little Bitterroot River are the main streams within the area. There are numerous reservoirs and natural wetlands in the valley floor. The landscape is slightly dissected.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include logging, grazing and some mining.

Subsection Ecological Relationships:

This subsection consists of three primary landscape settings. These include residual belt mountains, broad valley bottom and rolling foothills.

The residual belt mountains are located on mid to high elevation sites with dominant slope gradients from 50 to 80 percent. These landscapes include ridgetop, slope and narrow valley landforms that are formed in quartzites, siltites and argillites from the precambrian Belts Formation. The primary soils are shallow to moderately deep with textures of loam and sandy loam. These soils are classified as Ustochrepts, Xerochrepts and Eutrochrepts. The dominant potential natural vegetation is typically Douglas fir/ Larch types on the wetter sites with Subalpine fir/Spruce types on the high elevation sites. Grass and Ponderosa pine types occur on the hot dry sites,

The broad valley bottom are located on low elevation sites with dominant slope gradients from 0 to 35 percent. These landscapes include floodplain, bench and terrace landforms that are formed in glacial till and outwash plains, Lake Missoula sediments and local alluvium. The primary soils are deep with textures of silt loam and clay loam. These soils are classified as Calcixerollic, Ustochrepts and Aquents. The dominant potential natural vegetation is typically grasslands and Ponderosa pine types on the hot dry sites with hardwoods on the floodplains.

The rolling foothills are located on mid elevation sites with dominant slope gradients from 25 to 55 percent. These landscapes include ridge and rolling hill plus narrow draw landforms that are formed in quartzites, siltites and argillites from the precambrian Belts Formation plus some glacial till and Lake Missoula sediments. The primary soils are moderately deep to deep with textures of loam to clay loam. These soils are classified as Xerochrepts, Eutrochrepts and Aquents. The dominant potential natural vegetation is typically grasslands and Ponderosa pine types on the hot dry sites while Douglas fir types occur on the wetter sites.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M333Ca Livingston and Lewis Ranges

Location: This subsection is located in the Flathead River Basin of northwestern Montana.

Subsection Concept: This subsection consists of thrust faulted mountains of Precambrian metasedimentary bedrock that have been strongly shaped by alpine glaciation. Subalpine and mesic coniferous forests dominates the landscapes. This map unit is separated from similar thrust faulted mountains based upon bedrock lithology.

Subsection Setting and General Characteristics: These block faulted mountains have a elevation range of 3200 to 10,100 feet (975 to 3,078 meters). The slope range is 2 to 90 percent. The dominant lithology is Precambrian metasedimentary argillites, siltites, and dolomites. The primary geomorphic processes in these landscapes are glacial and fluvial erosion.

Mean annual precipitation ranges from 20 inches (51 cm) in the valley bottom to 110 inches (279 cms) at the mountain tops. Most precipitation occurs in the winter and spring months. Eighty percent of the precipitation falls as snow in the mountainous portion of the map unit. The mean annual air temperature is from 26 to 38 degrees F (-3 to 3 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occur in the valley bottom and footslope locations associated with glacial-fluvial and alluvial deposits. Lakes occur in cirque basins and glacial valley bottoms. Wetlands and lakes represent a major component of this subsection.

The primary natural disturbance processes are wildfire, avalanche, insect epidemics, and wind throw. This subsection is almost entirely designated national park lands, therefore human-caused disturbances are very limited except minor rural development along the major river terraces.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include alluvial bottom, glacial outwash and lacustrine landforms, that are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, silt loams and extremely gravelly silt loams. These soils are classified as Dystric Eutrochrepts, Glossic Cryoboralfs, and Typic Udifluvents. The dominant potential natural vegetation is Douglas-fir, Engelmann spruce, western red cedar, and subalpine fir series.

The uplands are located on low to mid elevation sites with slopes from 10 to 40 percent. These landscapes include glacial moraine landforms, formed in glacial till and volcanic ash parent materials. The primary soils are deep, gravelly silt and sandy loams. These soils are classified as Andeptic Cryoboralfs. The dominant potential natural vegetation is subalpine fir, Douglas-fir, and Engelmann spruce series.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 50 to 100+ percent. Ridgetop sites have slopes ranging from 10 to 25 percent. These landscapes have glacial cirque headwall, cirque basin, alpine ridges, and glacial trough wall landforms; that are formed in residual bedrock, glacial till, and volcanic ash parent materials. The primary soils are shallow to moderately deep, gravelly silt loams. These soils are classified as Andic, Typic and Lithic Cryochrepts. Rock outcrop is

a major component of this landscape. The dominant potential natural vegetation is subalpine fir and whitebark pine series. Alpine tundra and alpine meadow vegetation occurs at higher elevations.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Cb Flathead Block Faulted Mountains

Location: This subsection is located in the North and Middle Forks of the Flathead River Basin in northwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains of Precambrian metasedimentary bedrock that have been strongly shaped by alpine glaciation. Subalpine and mesic coniferous forests dominates the landscapes. This map unit is separated from similar subsections based upon, cooler and drier climatic characteristics for a majority of the subsection.

Subsection Setting and General Characteristics: These block faulted mountains have a elevation range of 2900 to 8000 feet (884 to 2,438 meters). The slope range is 2 to 70 percent. The dominant lithology is Precambrian metasedimentary argillites, siltites, and dolomites. The primary geomorphic processes in these landscapes are glacial and fluvial erosion or deposition.

Mean annual precipitation ranges from 20 inches (51 cm) in the valley bottom to 110 inches (279 cms) at the mountain tops. Most precipitation occurs in the winter and spring months. Eighty percent of the precipitation falls as snow in the mountainous portion of the map unit. The mean annual air temperature is from 30 to 40 degrees F (-1 to 4 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occurs in the valley bottom locations associated with glacial-fluvial and alluvial deposits. Lakes occur in cirque basins and glacial valley bottoms. Wetlands and lakes represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect epidemics, and wind throw. Human-caused disturbances include rural and suburban development along river terraces; and timber management on low to mid elevation forested sites.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include alluvial bottom, glacial outwash and lacustrine landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, silt loams and extremely gravelly silt loams. These soils are classified as Dystric Eutrochrepts, Glossic Cryoboralfs, and Typic Udifluvents. The dominant potential natural vegetation is Douglas-fir, and subalpine fir series.

The uplands are located on low to mid elevation sites with slopes from 10 to 40 percent till and volcanic ash parent materials. The primary soils are deep, gravelly silt and sandy loams. These soils are classified as Andeptic Cryoboralfs and Typic Eutroborealfs. The dominant potential natural vegetation is subalpine fir, grand fir, Douglas-fir, and western red cedar series.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 50 to 70 percent. Ridgetop sites have slopes ranging from 10 to 25 percent. These landscapes have glacial cirque headwall, cirque basin, alpine ridges, and glacial trough wall landforms; that are formed in residual bedrock, glacial till, and volcanic ash parent materials. The primary soils are shallow to moderately deep, gravelly silt loams. These soils are classified as Andic, Typic and Lithic Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series. Douglas-fir series occurs on southerly aspects, and alpine meadow vegetation occurs at higher elevations.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Cd Swan Basin Mountains and Valleys

Location: This subsection is located in the Swan River Basin of northwestern Montana.

Subsection Concept: This subsection consists of block faulted mountains and a major intermontane valleys of Precambrian metasedimentary bedrock that have been strongly shaped by alpine glaciation. Subalpine and mesic coniferous forests dominates the landscapes. This map unit is separated from similar subsections based upon, warmer and wetter climatic characteristics for a majority of the subsection.

Subsection Setting and General Characteristics: These block faulted mountains have a elevation range of 2,900 to 9,300 feet (884 to 2,834 meters). The slope range is 2 to 70 percent. The dominant lithology is Precambrian metasedimentary argillites, siltites, and dolomites. The primary geomorphic processes in these landscapes are glacial and fluvial erosion or deposition.

Mean annual precipitation ranges from 20 inches (51 cms) in the valley bottom to 110 inches (279 cms) at the mountain tops. Most precipitation occurs in the winter and spring months. Eighty percent of the precipitation falls as snow in the mountainous portion of the map unit. The mean annual air temperature is from 30 to 38 degrees F (-1 to 3 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occurs in the valley bottom locations associated with glacial moraine, glacial-fluvial and alluvial deposits. Lakes occur in cirque basins and glacial valley bottoms. Wetlands and lakes represent one of major components of this subsection.

The primary natural disturbance processes are wildfire, insect epidemics, and wind throw. Human-caused disturbances include rural and suburban development along river and lake terraces; and timber management on low to mid elevation forested sites.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include alluvial bottom, glacial outwash and lacustrine landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, silt loams and extremely gravelly silt loams. These soils are classified as Dystric Eutrochrepts, Glossic Cryoboralfs, and Typic Udifluvents. The dominant potential natural vegetation is Douglas-fir, and subalpine fir series.

The uplands are located on low to mid elevation sites with slopes from 10 to 40 percent. These landscapes include glacial moraine landforms, formed in glacial till and volcanic ash parent materials. The primary soils are deep, gravelly silt and sandy loams. These soils are classified as Andeptic Cryoboralfs and Typic Eutroborealfs. The dominant potential natural vegetation is grand fir, western red cedar, Douglas-fir, and subalpine fir series.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 50 to 70 percent. Ridgetop sites have slopes ranging from 10 to 25 percent. These landscapes have glacial cirque headwall, cirque basin, alpine ridges, and glacial trough wall landforms; that are formed in residual bedrock, glacial till, and volcanic ash parent materials. The primary soils are shallow to moderately deep, gravelly silt loams. These soils are classified as Andic, Typic and Lithic Cryochrepts. The dominant

potential natural vegetation is subalpine fir and whitebark pine series. Douglas-fir series occurs on southerly aspects, and alpine meadow vegetation occurs at higher elevations.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Cg Flathead Thrust Faulted Mountains

Location: This subsection is located in the upper Middle and South Forks of the Flathead River Basin in northwestern Montana.

Subsection Concept: This subsection consists of thrust faulted mountains of Paleozoic thru Cenozoic aged sedimentary bedrock, that have been strongly shaped by alpine glaciation. Subalpine and mesic coniferous forests dominates the landscapes. This map unit is separated from similar thrust faulted mountains based upon bedrock lithology.

Subsection Setting and General Characteristics: These thrust faulted mountains have a elevation range of 3,680 to 8,500 feet (1,120 to 2,590 meters). The slope range is 2 to 70 percent. The dominant lithology is Paleozoic, Mesozoic, and Cenozoic sandstones, shales, limestones, and conglomerates. The primary geomorphic processes in these landscapes are glacial and fluvial erosion or deposition. Mass movement is a secondary geomorphic process on portions of the steeper landscapes.

Mean annual precipitation ranges from 20 inches (51 cms) in the valley bottom to 90 inches (229 cms) at the mountain tops. Most precipitation occurs in the winter and spring months. Eighty percent of the precipitation falls as snow in the mountainous portion of the map unit. The mean annual air temperature is from 30 to 35 degrees F (-1 to 2 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to moderately dissected with surface streams and rivers. Wetlands occurs in the valley bottom locations associated with glacial-fluvial, lacustrine, and alluvial deposits; and are a minor component of this subsection. Lakes occur in cirque basins and glacial valley bottoms, they represent a very minor component of this subsection.

The primary natural disturbance processes are wildfire, insect epidemics, and wind throw. This subsection is located almost entirely in designated wilderness areas; therefore human-caused disturbances are very minor.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, uplands, and alpine landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 15 percent. These landscapes include alluvial bottom, glacial outwash and lacustrine landforms. That are formed in stratified fluvial deposits of gravels, sands, or silts. The primary soils are deep, silt loams, very gravelly clay loams, and very gravelly sandy loams. These soils are classified as Dystric Eutrochrepts, Glossic Cryoboralfs, and Typic Udifluvents. The dominant potential natural vegetation is Douglas-fir, and subalpine fir series.

The uplands are located on low to mid elevation sites with slopes from 10 to 40 percent. These landscapes include glacial moraine and mountain slope landforms, that are formed in glacial till, residual, and volcanic ash parent materials. The primary soils are deep, gravelly clay loams or gravelly sandy loams. These soils are classified as Typic Eutrobtoralfs and Andeptic Cryoboralfs. The dominant potential natural vegetation is Douglas-fir and subalpine fir series; with intermingled mesic grasslands.

The alpine landscapes are located on mid to high elevation sites, with the dominant slopes from 50 to 70 percent. Ridgetop sites have slopes ranging from 10 to 25 percent. These landscapes have glacial cirque headwall, cirque basin, alpine ridges, and glacial trough wall landforms; that are formed in residual bedrock, glacial till, and volcanic ash parent materials. The

primary soils are shallow to moderately deep, gravelly clay loams and gravelly sandy loams. These soils are classified as Andic, Typic and Lithic Cryochrepts. The dominant potential natural vegetation is subalpine fir and whitebark pine series, with intermingled mesic grasslands. Douglas-fir series occurs as a minor component on southerly aspects.

Compiled By: Flathead NF, D. Sirucek and W. Basko.

M333Da Coeur d' Alene Mountains

Location: This subsection is located in the Coeur d' Alene River Basin of northern Idaho.

Subsection Concept: This subsection consists of faulted mountains of Precambrian metasedimentary bedrock, which includes primarily quartzites, siltites, and argillites. This subsection also has inclusions of basalt on the western edge, and granitics on the east and north side of Hayden lake and in the south end of the Lake Pend Oreille area. Stream valley incision and slope erosion, deposition, frost churning, and a small amount of alpine glaciation make up the dominant land-forming processes. Mesic coniferous forests dominates the landscapes with some subalpine forest. This map unit is separated from similar subsections based on geology consisting of primarily the basement formations of the Belt Supergroup rocks, landforms tend to be lower relief mountains which are more highly dissected.

Subsection Setting and General Characteristics: These faulted mountains have an elevation range of 2150 to 6500 feet (655 to 1980 meters). The dominant slope range is 20 to 70 percent. The dominant types of rocks are quartzites, argillites and siltites. The primary geomorphic process in these landscapes is stream incision and slope erosion, frost churning and associated mantle creep and a small amount of alpine glaciation at the highest elevations.

Mean annual precipitation ranges from 25 inches/64 cms at the lowest elevations to 60 inches/152 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events frequently occur in this subsection. The mean annual air temperature is 32 to 47 degrees F (0 to 8 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately to highly dissected with surface streams and rivers. Wetlands occur as narrow bands along the streams. Hayden, Fernan, Coeur d' Alene and Pend Oreille Lakes occur in or directly adjacent to this subsection. Lakes also occur in a few of the high elevation cirque basins.

The primary natural disturbance processes are wildfire, root-rot and insect epidemics, flooding during spring snowmelt and from winter rain on snow events, during this time is when most natural mass failure tend to occur. Human-caused disturbances include intensive timber harvest, rural and suburban development along rivers and lakes, and heavy mining and smelter operations in the Silver Valley of this subsection.

Subsection Ecological Relationships:

This subsection has a repeating pattern of three primary landscape settings. These include valley bottoms, dissected uplands, and high elevation, convex, mountain slopes.

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrands, Aquands, Cryands, Aquepts, and Boralfs. The dominant potential natural vegetation is grand fir, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The dissected uplands are located at low to mid elevations on the mountain slopes and ridges with dominant slope gradients of 10 to 80 percent. The major landform features consist of moderate relief, dissected and non

dissected mountain slopes, stream breaklands, nivational hollows and ridges comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 12 to 28 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 45 percent rock fragments. Sandy loam, fine sandy loam, silt loam, or clay loam subsoil textures are associated with soils underlain by quartzite, siltite and argillite. Subsoils contain 20 to 85 percent rock fragments. The major soils on the well drained sites are Typic Udivitrands and Alfic Udivitrands, with Humic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western hemlock, grand fir and Douglas fir series.

The high elevation, convex, mountain slopes consist of ridges and sideslopes with dominant slope gradients of 10 to 60 percent. The major landform features consist of broadly convex ridges and mountain sideslopes comprised of colluvium and residuum, with inclusions glacial cirques and troughs. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 14 to 25 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 15 to 50 percent rock fragments. Sandy loam and silt loam subsoil textures are associated with soils underlain by quartzite and siltite. Subsoils contain 50 to 95 percent rock fragments. The major soils on the well drained sites are Vitric Haplocryands, with Vitric Fulvicryands occurring in the more poorly drained sites. The dominant potential natural vegetation is subalpine fir with incidental occurrences of mountain hemlock and whitebark pine series.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Db St. Joe Mountains

Location: This subsection is located in the St. Joe River Basin of northern Idaho.

Subsection Concept: This subsection consists of faulted mountains of Precambrian metasedimentary bedrock, which includes primarily quartzites, siltites, and argillites. This subsection also has inclusions of coherent schist. Stream valley incision and slope erosion, deposition, frost churning, and alpine glaciation make up the dominant land-forming processes. Mesic coniferous forests and subalpine forests dominate the landscapes. This map unit is separated from similar subsections based on landforms consisting of mid and higher relief mountains, and the majority of the area consists of Belt Supergroup rocks of the Wallace formation.

Subsection Setting and General Characteristics: These faulted mountains have an elevation range of 2200 to 7700 feet (670 to 2347 meters). The dominant slope range is 20 to 70 percent. The dominant types of rocks are quartzites, argillites and siltites. The primary geomorphic process in these landscapes is stream incision and slope erosion, frost churning and associated mantle creep and alpine glaciation at the highest elevations.

Mean annual precipitation ranges from 35 inches/89 cms at the lowest elevations to 60 inches/152 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events periodically occur in this subsection. The mean annual air temperature is 30 to 47 degrees F (-1 to 8 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to highly dissected with surface streams and rivers. Wetlands occur as narrow bands along the streams and in association with glaciated cirque basins and troughs. Lakes are also associated with the high elevation cirque basins.

The primary natural disturbance processes are wildfire, root-rot, insect epidemics, and flooding during spring snowmelt and from winter rain on snow events. During the time of flooding is when most natural and management induced mass failures tend to occur. Human-caused disturbances include intensive timber harvest, and mining.

Subsection Ecological Relationships:

This subsection has a repeating pattern of four primary landscape settings. These include valley bottoms, dissected and non-dissected unglaciated mountains, high elevation, convex, mountain slopes, and alpine glaciated landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrands, Aquands, Cryands, Aquepts, and Boralfs. The dominant potential natural vegetation is grand fir, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The dissected and non-dissected unglaciated mountains are located at low to mid elevations on the mountain slopes and ridges with dominant slope gradients of 10 to 80 percent. The major landform features consist of moderate to high relief, dissected and non dissected mountain slopes, stream breaklands, nivalational hollows and ridges comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers

12 to 28 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 10 to 45 percent rock fragments. Sandy loam, fine sandy loam, silt loam, or clay loam subsoil textures are associated with soils underlain by quartzite, siltite and argillite. Subsoils contain 20 to 85 percent rock fragments. The major soils on the well drained sites are Typic Udivitrands and Alfic Udivitrands, with Humic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western hemlock, western redcedar, grand fir and Douglas fir series.

The high elevation, convex, mountain slopes consist of ridges and sideslopes with dominant slope gradients of 10 to 60 percent. The major landform features consist of broadly convex ridges and mountain sideslopes comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 14 to 25 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 15 to 50 percent rock fragments. Sandy loam and silt loam subsoil textures are associated with soils underlain by quartzite and siltite. Subsoils contain 50 to 95 percent rock fragments. The major soils on the well drained sites are Vitric Haplocryands, with Vitric Fulvicryands occurring in the more poorly drained sites. The dominant potential natural vegetation is mountain hemlock, subalpine fir and whitebark pine series.

The alpine glaciated landscapes consist of glacial cirque headwalls, cirque basins, short transport glacial troughs and glacially scoured and till deposited mountain slopes, with dominant slope gradients of 10 to 100 percent. Some cirque headwalls, scoured trough walls and ridges are dominated by rock outcrop, talus and shallow soils. The major soils in cirque basins, troughs, timbered cirque headwalls, and in depositional tills are a complex of soils with thick dark colored surface layers in depressional areas, and along drainages and soils with thin dark colored surface layers on the better drained sites. Soils in depressional areas, and along drainages are deep, and tend to have dense, brittle subsoils which perch ground water into the surface layers. Soils on the sideslopes and better drained sites are deep, and tend to be friable, with permeable subsoils. All soils have silt loam, volcanic ash surface layers which range from 14 to 28 inches thick. These surface ash layers are often mixed with underlying material and have rock fragment contents ranging from 5 to 50 percent. Subsoils tend to be sandy loams and contain 50 to 95 percent rock fragments. The shallow soils are classified as Lithic Haplocryands and Lithic Cryochrepts. The major soil on the deep, well drained sites, are Vitric Haplocryands, with Vitric Fulvicryands occurring in the deep, poorly drained sites. The dominant potential natural vegetation is mountain hemlock, subalpine fir, whitebark pine series, and grass/sedge wetlands.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Dc Clark Fork Valley and Mountains

Location: This subsection is located in west central Montana within the Columbia River Basin.

Subsection Concept: This subsection consists of moist, residual belt mountains on both sides of the Clark Fork valley formed in quartzites and argillites that have been modified by colluvial and fluvial processes at the lower elevations and frost churning at the higher elevations. The mountain slopes are composed of very steep rocky soils on stream breaklands. The valley floor and foothills are comprised of mainly Lake Missoula sediments and local alluvium. The major general vegetative types include coniferous forest with grass and shrublands in the valley bottom. This map unit is separated from adjacent subsections based upon climatic and vegetative factors.

Subsection Setting and General Characteristics: These moist, residual belt mountains have an elevational range of 2300 to 7200 feet/708 to 2215 meters. The dominant slope range is 0 to 100 percent. The dominant types of rocks are quartzites and argillites bedrock types. The primary geomorphic processes in these landscapes are colluvial, fluvial and residual.

Mean annual precipitation ranges from 25 inches/64 cms on the valley floor to 80 inches/203 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 28 to 45 degrees F/-2 to 7 degrees C.

Streams occur in narrow valleys with the Clark Fork in a broad valley. The landscape is moderately dissected. The Clark Fork River bisects this area with its two associated reservoirs and natural wetlands. There are a number of high elevation cirque lakes within this area.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include (urban/suburban development, logging, mining and minor amounts of grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include mountain ranges and the Clark Fork Valley.

The mountain ranges are located on mid to high elevation sites with dominant slope gradients from 40 to 75 percent. These landscapes include slope, ridgetop and narrow valley landforms that are formed in quartzite and argillite parent materials. The primary soils are shallow to moderately deep with textures of loam, sandy loam and silt loam. These soils are classified as Xerochrepts, Eutrochrepts and Vitrandepts. The dominant potential natural vegetation is Douglas fir/ Larch types on the wetter sites with Subalpine fir/Spruce types at the higher elevation sites.

The Clark Fork Valley is located on low elevation sites with dominant slope gradients that range from 0 to 50 percent. These landscapes include bench, foothill and floodplain landforms that are formed in quartzites and argillites parent materials. The primary soils are deep with textures of loam, silt loam and clay loam. These soils are classified as Xerochrepts, Eutrochrepts and Vitrandepts. The dominant potential natural vegetation is The potential natural vegetation is typically Ponderosa pine types on the hot dry sites with marsh in the wettest sites of the floodplain.

Compiled By: Lolo National Forest, Wayne D. Barndt

M333Dd Clarkia Hills and Mountains

Location: This subsection is located in the St. Joe and North Fork of the Clearwater River Basins of northern Idaho.

Subsection Concept: This subsection mainly consists of hills, rolling uplands and mountains formed by a complex of major geologic structures which include: Precambrian metasedimentary bedrock, which consists of quartzites, siltites, and argillites; intrusions of granites of the Idaho Batholith; and schists, gneiss, and anorthosite, commonly called borderzone materials, and Columbia River basalts. Stream incision and slope erosion, deposition, and frost churning make up the dominant land-forming processes. Mesic coniferous forests dominate the landscapes, with some minor areas of subalpine forests. This map unit is separated from similar subsections based on a mix of geology which includes weakly to highly weathered belts, granite, schist, gneiss, basalt and anorthosite. The landscapes consist of low to mid relief, highly dissected, hills and mountains.

Subsection Setting and General Characteristics: These hills, rolling uplands and mountains have an elevation range of 2200 to 5500 feet (670 to 1676 meters). The dominant slope range is 10 to 60 percent. The dominant types of rocks are quartzites, argillites, siltites, granites, gneiss, schist, anorthosite and basalt. The primary geomorphic process in these landscapes is stream incision and slope erosion, deposition, frost churning and associated mantle creep and a minor inclusion of alpine glaciation at the highest elevations.

Mean annual precipitation ranges from 30 inches/76 cms at the lowest elevations to 55 inches/140 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events periodically occur in this subsection. The mean annual air temperature is 35 to 50 degrees F (2 to 10 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is moderately to highly dissected with dry draws, surface streams and rivers. Wetlands and in some cases lakes occur along the rivers and streams. Coeur d' Alene lake and numerous other lakes occur at the lower end of the Coeur d' Alene and St. Joe Rivers within this subsection.

The primary natural disturbance processes are wildfire, root-rot, insect epidemics, and flooding during spring snowmelt and from winter rain on snow events. During the time of flooding is when most natural and management induced mass failures tend to occur. Human-caused disturbances include intensive timber harvest, rural and suburban development, farming and ranching, and mining.

Subsection Ecological Relationships:

This subsection has a repeating pattern of four primary landscape settings. These include valley bottoms, rolling uplands, dissected and non-dissected unglaciated mountains, high elevation, convex, mountain slopes.

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrands, Aquands, Cryands, Aquepts, and Boralfs. The dominant potential natural vegetation is grand fir, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The rolling uplands are located at low to mid elevations with dominant slope gradients of 10 to 50 percent. The major landform features include low to moderate relief hills, with closely spaced, dendritic, short reach drainage patterns. The major soils are deep, well weathered and have silt loam surface layers 12 to 30 inches thick derived from volcanic ash influenced loess. Sandy loam, loam, silt loam and clay loams are the dominant subsoil textures, except in the granitics where some sand textures occur. Both surface and subsurface rock fragments are generally less than 35 percent on the well weathered soils and higher on the less weathered soils. The major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands, with Humic Udivitrands and Aquic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western redcedar, grand fir and Douglas fir series.

The dissected and non-dissected unglaciated mountains are located at mid elevations on the mountain slopes and ridges with dominant slope gradients of 10 to 80 percent. The major landform features consist of moderate to high relief, dissected and non dissected mountain slopes, stream breaklands, nivalational hollows and ridges comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 12 to 28 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 0 to 45 percent rock fragments. Sandy loam, fine sandy loam, silt loam, loam, or clay loam subsoil textures are associated with soils underlain by quartzite, siltite, argillite, and schist. Subsoil textures associated with granite, gneiss and anorthosite tend to range from sand to sandy loam. Subsoils contain 10 to 85 percent rock fragments. The major soils on the well drained sites are Typic Udivitrands and Alfic Udivitrands, with Humic Udivitrands and Aquic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western redcedar, grand fir, and Douglas fir series.

The high elevation, convex, mountain slopes consist of ridges and sideslopes with dominant slope gradients of 10 to 60 percent. The major landform features consist of broadly convex ridges and mountain sideslopes comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 14 to 25 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 15 to 50 percent rock fragments. Sandy loam, loam, and silt loam subsoil textures are associated with soils underlain by quartzite, siltite and schist. Sand to sandy loam textures are associated with granite, gneiss and anorthosite. Subsoils contain 50 to 95 percent rock fragments. The major soils on the well drained sites are Vitric Haplocryands, with Vitric Fulvicryands occurring in the more poorly drained sites. The dominant potential natural vegetation is mountain hemlock, and subalpine fir series.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333De Clearwater Uplands

Location: This subsection is located in the Clearwater River Basin of north central Idaho.

Subsection Concept: This subsection consists of dissected remnants of an ancient peneplain surface that existed prior to the Columbia River Basalt Flows and has subsequently been uplifted and downcut. The dominant landform is low relief, rolling uplands with dense dendritic drainage patterns formed in granitic parent materials of the Idaho Batholith. It is in a zone of maritime climatic influence. Mesic and subalpine forests dominate the landscapes. This map unit is separated from similar dissected lands by geologic parent material, potential vegetation and soils.

Subsection Setting and General Characteristics: Elevations range between 2500 and 6500 feet (750 to 1900 m). The slope range is 20 to 50 percent. The dominant lithology is Idaho Batholith granitics and associated gniesses and pigmatites. Stream drainage characteristics in these landscapes were formed by strong fluvial action under ancient climatic regimes. These processes are no longer active and have been replaced by deep chemical weathering. These "old surfaces" are being downcut by tributaries of the Clearwater River resulting in rejuvenated stream breaklands occurring along major stream courses which dissect the "old surface" landforms. Local ridge systems dominated by colluvial and frost churning landforming processes constitute most of the area above 5000 feet in this subsection..

Mean annual precipitation ranges from 35 inches (89 cm) in the valley bottoms to 60 inches (152 cm) at the mountain tops. Most precipitation occurs in the winter and spring as snow above about 4000 feet and as rain below this elevation. Rain on snow hydrologic events are common below 4500 feet. The mean annual air temperature is from 33 to 45 degrees F (1 to 9 degrees C).

The characteristic surface water features associated with this subsection include streams, and wetlands. Typically the landscape is highly dissected with low order surface streams. Wetlands occur in valley bottoms of larger order streams and in depressions on sideslopes. Wetlands represent a minor component of this subsection.

The primary natural disturbance processes are wildfire, insect and disease activity, and windthrow. The natural fire regime is one of low to moderate frequency, moderate to high severity and moderate to large extent. More frequent fires on ridges are usually of low severity. Mass movement in the form of debris avalanches occur on steep, rejuvenated stream breaklands along streams dissecting "old surface" landforms is associated with post fire conditons and rain on snow or rapid snowmelt. Substrata are highly erodible. Fire suppression may have altered plant community composition from historic patterns through advancement of succession, alteration of subsequent fire behavior, and increased pathogen activity. Road building has altered sediment regimes from historic patterns.

Subsection Ecological Relationships:

This subsection consists of uplands including rolling hills, colluvial slopes and convex frost churned ridges, with minor inclusions of weakly glaciated slopes. Soils have formed in well weathered granitics and associated gniesses of the Idaho Batholith and usually have a loessial depposited volcanic ash cap.

The primary soils are deep and very deep sandy loams and loamy sands with a silt loam ash cap. These soils are classified as Typic Fulvicryands, Typic Haplocryands, and Typic and Humic Udivitrands. The dominant potential natural vegetation is western red cedar, grand fir, subalpine fir and mountain hemlock series.

Compiled by: Clearwater N. F., Dale Wilson

M333Df North Fork Breaklands

Location: This subsection is located in the North Fork of the Clearwater River Basin of north central Idaho.

Subsection Concept: This subsection consists rejuvenated stream breaklands and associated landforms formed on weathered "grussic" granitics of the Bungalow Pluton of the Idaho Batholith. Strongly expressed stream breakland landforms dominate the landscape, however low relief rolling "old surfaces", convex frostchurned ridges and alpine glaciated ridges occupy significant portions of the landscape. It is in a zone of maritime climatic influence. Mesic and subalpine forests dominate the landscapes. This map unit is separated from subsections by lithology and landform patterns.

Subsection Setting and General Characteristics: Elevations range between 2000 and 6500 feet (600 to 2000 m). The slope range is 20 to 60+ percent and varies by landform. Lithology consists of weathered Idaho Batholith granitics of the Bungalow Pluton. All landforms are deeply weathered including streambreaks and higher elevation frost churned ridges which are more strongly weathered in this map unit than similar landforms in other map units. Soil mantles developed from this parent material are highly erodable. This subsection is thought to have one of if not the highest natural erosion rates in North Central Idaho. Mass wasting in the form of debris torrents and avalanches is the dominant form of erosion however, dry creep and overland flow erosion is common in localized areas. All slopes were originally covered with a 1 to 2 (.3 to .6 m) foot thick volcanic ash cap which has been completely or partially eroded away over a significant portion of the mapping unit.

Mean annual precipitation ranges from 40 inches (100cm) in the valley bottoms to 80 inches (200 cm) at the mountain tops. Most precipitation occurs in the winter and spring as snow above about 4000 feet (1200m). and as rain and snow below this elevation. Rain on snow hydrologic events are common below 4500 (1370m) feet. The mean annual air temperature is from 33 to 45 degrees F (1 to 9 degrees C).

The characteristic surface water features associated with this subsection include streams, and small alpine lakes. Stream system characteristics though closely related to the various landforms in the mapping unit are highly variable for the mapping unit as a whole. Wetlands, a minor component, occur as meadows in valley bottoms and in glaciated landforms. wetlands. Typically the landscape is highly dissected with low order surface streams. Wetlands occur in valley bottoms of larger order streams and in depressions on sideslopes.

The primary natural disturbance processes are wildfire, insect and disease activity, and windthrow. The natural fire regime is variable because of the various landforms and vegetative types making up the mapping unit. Mass movement in the form of debris avalanches occur on steep, rejuvenated stream breaklands along streams dissecting "old surface" landforms and is associated with post fire conditions and rain on snow or rapid snowmelt. Substrata are highly erodible. Fire suppression may have altered plant community composition from historic patterns through advancement of succession, alteration of subsequent fire behavior, and increased pathogen activity.

Subsection Ecological Relationships:

This subsection consists of stream breaklands, colluvial slopes and convex frost churned and alpine glaciated ridges. Soils have formed in well weathered granitics of the Idaho Batholith and usually have a loessial deposited volcanic ash cap.

The primary soils are deep and very deep sandy loams and loamy sands with a silt loam ash cap. Ash caps have been removed or partially removed through erosion on localized slopes scattered throughout the mapping unit.

Dystrochrepts and vitriands soils and grand fir and western red cedar vegetation dominate stream breaklands. Vitriands dominate "old surface" landforms along with western red cedar vegetative series. Typic Haplocryands and Cryochrepts dominate frost churned and alpine glaciated landforms along with subalpine fir and montain hemlock vegetative series.

Compiled by: Clearwater N. F., Dale Wilson

M333Dg Little North Fork Mountains

Location: This subsection is located in the northern end of the Clearwater River Basin of northern Idaho.

Subsection Concept: This subsection mainly consists of mountains formed by a complex of major geologic structures which include: Precambrian metasedimentary bedrock, which consists of quartzites, siltites, and argillites; intrusions of granites of the Idaho Batholith; and schists, gneiss, and anorthosite, commonly called borderzone materials. Stream valley incision and slope erosion, deposition, frost churning, and alpine glaciation make up the dominant land-forming processes. Mesic coniferous forests and subalpine forests dominate the landscapes. This map unit is separated from similar subsections based on a mix of geology which includes belts, granitics, schist, gneiss and anorthosite. Mid and high relief mountain landforms dominate this subsection.

Subsection Setting and General Characteristics: These mountains have an elevation range of 3000 to 7000 feet (915 to 2135 meters). The dominant slope range is 20 to 70 percent. The dominant types of rocks are quartzites, argillites, siltites, granites, gneiss, schist, and anorthosite. The primary geomorphic process in these landscapes is stream incision and slope erosion, deposition, frost churning and associated mantle creep and alpine glaciation at the highest elevations.

Mean annual precipitation ranges from 35 inches/89 cms at the lowest elevations to 60 inches/152 cms at the highest elevations. Most of the precipitation occurs from November through March, primarily in the form of snow, rain on snow events periodically occur in this subsection. The mean annual air temperature is 30 to 50 degrees F (-1 to 10 degrees C).

The characteristic surface water features associated with this subsection include streams, rivers, lakes and wetlands. Typically the landscape is weakly to highly dissected with dry draws, surface streams and rivers. Wetlands occur as narrow bands along the streams and in association with glaciated cirque basins and troughs. Lakes are also associated with the high elevation cirque basins.

The primary natural disturbance processes are wildfire, root-rot, insect epidemics, and flooding during spring snowmelt and from winter rain on snow events. During the time of flooding is when most natural and management induced mass failures tend to occur. Human-caused disturbances include intensive timber harvest.

Subsection Ecological Relationships:

This subsection has a repeating pattern of four primary landscape settings. These include valley bottoms, dissected and non-dissected unglaciated mountains, high elevation, convex, mountain slopes, and alpine glaciated landscapes.

The valley bottoms are located on low elevation sites with slopes from 1 to 35 percent. These landscapes include alluvial bottoms, stream terraces, fans and toeslopes. The soils are undifferentiated, properties vary with parent materials, drainage and topographic position. Surface soils are generally volcanic ash influenced. Subsoil textures are highly variable, along with rock fragments. Drainage classes are also highly variable, depending on depth to water table. Due to the variability of this unit the major suborder classification is as follows: Vitrands, Aquands, Cryands, Aquepts, and Boralfs. The dominant potential natural vegetation is grand fir, western redcedar, subalpine fir series and grass/willow/sedge riparian types.

The dissected and non-dissected unglaciated mountains are located at low to mid elevations on the mountain slopes and ridges with dominant slope gradients

of 10 to 80 percent. The major landform features consist of moderate to high relief, dissected and non dissected mountain slopes, stream breaklands, nivalational hollows and ridges comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 12 to 28 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 0 to 45 percent rock fragments. Sandy loam, fine sandy loam, silt loam, loam, or clay loam subsoil textures are associated with soils underlain by quartzite, siltite, argillite, and schist. Subsoil textures associated with granite, gneiss and anorthosite tend to range from sand to sandy loam. Subsoils contain 10 to 85 percent rock fragments. The major soils on the well drained sites are Typic Udivitrands and Alfic Udivitrands, with Humic Udivitrands occurring in the more poorly drained sites. The dominant potential natural vegetation is western redcedar, grand fir and Douglas fir series.

The high elevation, convex, mountain slopes consist of ridges and sideslopes with dominant slope gradients of 10 to 60 percent. The major landform features consist of broadly convex ridges and mountain sideslopes comprised of colluvium and residuum. The major soils on the ridges and sideslopes are deep and have silt loam surface layers 14 to 25 inches thick derived from volcanic ash influenced loess. The lower part of the surface layer contains 15 to 50 percent rock fragments. Sandy loam, loam, and silt loam subsoil textures are associated with soils underlain by quartzite, siltite and schist. Sand to sandy loam textures are associated with granite, gneiss and anorthosite. Subsoils contain 50 to 95 percent rock fragments. The major soils on the well drained sites are Vitric Haplocryands, with Vitric Fulvicryands occurring in the more poorly drained sites. The dominant potential natural vegetation is mountain hemlock, subalpine fir and whitebark pine series.

The alpine glaciated landscapes consist of glacial cirque headwalls, cirque basins, short transport glacial troughs and glacially scoured and till deposited mountain slopes, with dominant slope gradients of 10 to 100 percent. Some cirque headwalls, scoured trough walls and ridges are dominated by rock outcrop, talus and shallow soils. The major soils in cirque basins, troughs, timbered cirque headwalls, and in depositional tills are a complex of soils with thick dark colored surface layers in depressional areas, and along drainages and soils with thin dark colored surface layers on the better drained sites. Soils in depressional areas, and along drainages are deep, and tend to have dense, brittle subsoils which perch ground water into the surface layers. Soils on the sideslopes and better drained sites are deep, and tend to be friable, with permeable subsoils. All soils have silt loam, volcanic ash surface layers which range from 14 to 28 inches thick. These surface ash layers are often mixed with underlying material and have rock fragment contents ranging from 5 to 50 percent. Subsoils tend to be sandy loams and contain 50 to 95 percent rock fragments. The granitics and gneiss do not extend into this high alpine glaciated zone. The shallow soils are classified as Lithic Haplocryands and Lithic Cryochrepts. The major soil on the deep, well drained sites, are Vitric Haplocryands, with Vitric Fulvicryands occurring in the deep, poorly drained sites. The dominant potential natural vegetation is mountain hemlock, subalpine fir, whitebark pine series, and grass/sedge wetlands.

Compiled By: Idaho Panhandle National Forests: Jerry Niehoff

M333Dh Landowner Mountains

Location: This subsection is located along the state line in the Western Montana and is part of the Columbia River Basin.

Subsection Concept: This subsection consists of moderately dry, moderately weathered, residual mountains of quartzite and argillite from the precambrian Belts Formation that have been modified by colluvial and fluvial processes at the lower elevations and frost churning at the higher elevations. The major general vegetative type is coniferous forest with some areas of shallow soils or rock outcrop which support brushlands. This map unit is separated from similar subsections based upon climatic/vegetative factors. This subsection differs from adjacent units because of the habitats types that are encountered.

Subsection Setting and General Characteristics: This mountain range has an elevation range of 2600 to 7800 feet/800 to 2400 meters. The dominant slope range is 35 to 100 percent. The dominant types of rocks are quartzite and argillite from the precambrian Belts bedrock types. The primary geomorphic processes in these landscapes are colluvial and fluvial processes at the lower elevations and frost churning at the higher elevations.

Mean annual precipitation ranges from 25 inches/64 cms at the lower elevations to 80 inches/203 cms on the highest peaks. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 40 degrees F/-4 to 4 degrees C.

Streams occur in narrow valleys. The landscape is moderately dissected. The St. Regis River bisects the western end of the area which has associated natural wetlands. A few lakes occur in high elevation cirque basins.

The primary natural disturbance processes are fire, insects and disease. Human-caused disturbances include minor recreational development, logging and mining.

Subsection Ecological Relationships:

This subsection consists of one primary landscape setting which is moderately dry, moderately weathered, residual mountains.

The moderately dry, moderately weathered, residual mountains are located on mid to high elevation sites with dominant slope gradients from 35 to 100 percent. These landscapes include slope, ridgetop and narrow valley landforms that are formed in quartzite and argillite from the precambrian Belts parent materials. The primary soils are shallow to moderately deep with textures of loam, sandy loam and silt loam. These soils are classified as Cryandepts, Eutrochrepts and Eutrochrepts. The dominant potential natural vegetation is typically Douglas-fir/ Larch types on the wetter sites and Subalpine fir/Spruce types at the higher elevation sites.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M333Di Alberton Gorge

Location: This subsection is located along the Clark Fork Drainage in central western Montana. It is part of the Columbia River Basin.

Subsection Concept: This subsection consists of moderately dry, residual mountains on both sides of the Clark Fork and Ninemile valleys of quartzites and argillites from the precambrian Belts Formation. The southern tip of the area is made up of granitic and mica-schist parent material. These are confined to the Lolo Creek Drainage. The mountain slopes are composed of very steep rocky soils on stream breaklands. The valley floor and foothills are comprised of mainly Lake Missoula sediments and local alluvium. All materials have been modified by colluvial and fluvial processes at the lower elevations and frost churning at the higher elevations. The major general vegetative types include coniferous forest with some shrublands at locations that have shallow soils or rock outcrops. This map unit is separated from adjoining subsections based upon climatic or vegetative factors. The subsections to the north and west have more subdued landscapes. The subsection to the south is more dissected while the one to the east is a valley unit.

Subsection Setting and General Characteristics: These mountain ranges and valleys have an elevation range of 2500 to 7500 feet/769 to 2308 meters. The dominant slope range is 0 to 100 percent. The dominant types of rocks are quartzites and argillites from the precambrian Belts Formation. The southern tip of the area is made up of granitic and mica-schist parent materials. These are contained to the Lolo Creek Drainage. The primary geomorphic processes in these landscapes are colluvial, fluvial and residual.

Mean annual precipitation ranges from 25 inches/64 cms in the larger valleys to 60 inches/152 cms at the highest peaks. Most precipitation occurs in the winter and spring seasons with 50 percent of the precipitation falling as snow. The mean annual air temperature is 28 to 45 degrees F/-2 to 5 degrees C.

The Clark Fork and Ninemile Drainages bisects this area with their associated natural wetlands. The landscape is slightly to moderately dissected. Wetlands occur in the lower areas associated with alluvial deposits. Some high elevation alpine lakes occur in cirque basins.

The primary natural disturbance processes are fire, insects, disease and flooding. Human-caused disturbances include urban/suburban development, logging, mining, farming and grazing.

Subsection Ecological Relationships:

This subsection consists of two primary landscape settings. These include moderately dry, residual mountains on both sides of the Clark Fork and Ninemile valleys.

The residual mountains are located on mid to high elevation sites with dominant slope gradients from 35 to 100 percent. These landscapes include slope, ridgetop and narrow valley landforms that are formed in quartzites and argillites from the precambrian Belts Formation. The southern tip of the area is made up of granitic and mica-schist parent material. These are confined to the Lolo Creek Drainage. The primary soils are shallow to moderately deep with textures of loam, sandy loam and silt loam. These soils are classified as Xerochrepts and Eutrochrepts. The dominant potential natural vegetation is Douglas fir/ Larch types with Subalpine fir/Spruce types at the higher elevation sites.

The Clark Fork and Ninemile valleys are located on low elevation sites with dominant slope gradients from 0 to 50 percent. These landscapes include floodplain, bench and foothill landforms that are formed in alluvial materials

from various sources. The primary soils are deep with textures of loam, clay loam and silt loam. These soils are classified as Xerochrepts and Vitrandepts. The dominant potential natural vegetation is typically Ponderosa pine types on the hot dry sites. Some Douglas fir/ Larch types occur on the foothill areas.

Compiled By: Lolo National Forest, Wayne D. Barndt, Soil Scientist

M333Dj East Coeur d' Alene Mountains

Location: This subsection is located along the state line in northwestern Montana. It is along the lower Clark Fork of the Columbia River south of the river bottom.

Subsection Concept: This subsection consists of erosional mountains with alpine glaciation in the upper one-quarter of the drainages. The rock type is Precambrian metasedimentary materials that have been lightly to moderately shaped by alpine glaciation. Subalpine environments dominate the upper elevations. The major general vegetative type is coniferous forest with some brushy openings due to shallow soils or rock outcrops. This map unit is separated from similar subsections based upon geologic structure, parent material or climatic/vegetative factors. The subsections to the west and north receive higher levels of moisture. To the east and south the units become drier which changes the habitat types encountered.

Setting and General Characteristics: It is an erosional landscape that has been slightly modified by alpine glaciation. These erosional mountains have an elevation range of 2175 to 6500 feet/669 to 1970 meters. The dominant slope gradients range from 30 to 90 percent. Northwest-trending folds and faults are the dominant structural features. The underlying bedrock consists of Middle Proterozoic-aged, metasedimentary argillite, siltite, quartzite, and dolomite parent materials which are of the Belt Supergroup. There are minor granitic intrusions of quartz monzonite. These landscapes include slope, ridgetop and narrow valley landforms. The primary soils are shallow to deep with textures of loam, sandy loam and silt loam.

Mean annual precipitation ranges from 20 inches/51 cms in the valley bottom to 75 inches/191 cms at the Bitterroot Divide. The variation in precipitation occurs mainly because of the differences between low and high elevations. Most precipitation occurs in the winter and spring seasons with 70 percent of the precipitation falling as snow. The mean annual air temperature is 25 to 60 degrees F/-4 to 12 degrees C. Temperature extremes can range from -35 to 100 degrees F/-37 to 38 degrees C.

Streams occur in V-type valleys. The majority of the landscape is weakly to moderately dissected with surface streams. During a majority of the summer a portion of the lower to middle stream reach of all major drainages goes underground. Lakes occur in less than half of the cirque basins. Valley bottom wetlands occur as minor inclusions.

The primary natural disturbance process in this landscape is fire. Insects and disease epidemics and windthrow events also occur frequently. The lower and mid elevation vegetation has a high percentage of western larch, lodgepole pine, and Douglas-fir. These vegetation communities are associated with the insect- and disease-wildfire cycles. The wildfire regime is dominantly lethal with some lethal-non-lethal mixed regimes in riparian areas and at higher elevation sites. Man's influence became apparent in the late nineteenth century--land clearing (primarily by fire) associated with homesteading, mining, logging, railroading, etc.

The fire interval is 60 to 100 years on the lodgepole pine and larch sites and 200 years plus on the wetter sites. The stand replacement fires on the lethal regime sites have moderate to high intensity fires that kill 50 to 75 percent of the vegetation within a fire boundary. The wetter sites have low to moderate fire intensities and 20 to 50 percent of the vegetation is killed.

Ecological Relationships: This subsection has a repeating pattern of three primary settings. These include valley bottoms, uplands, and subalpine landscapes.

The valley bottoms (including the Clark Fork bottom) are located on low elevation sites with slopes of one to 20 percent. These landscapes include

alluvial bottom and lacustrine landforms. They are formed in mixed and stratified fluvial deposits of gravels, sands, silts and/or clays. The primary soils are deep, very gravelly sandy loams and deep, gravelly silty clay loams. These soils are classified as Andaqueptic Ochraqualfs, Eutric Glossoboralfs and Typic Dystrochrepts. The dominant potential natural vegetation are the western redcedar, subalpine fir, and Douglas-fir series.

The uplands are located on low to mid elevation sites with slopes from 30 to 70 percent with extremes from 10 to 100 percent. These landscapes are primarily fluvial (residual) landforms that are formed in argillites, siltites, and dolomites. Rock outcrop and talus are present along many side drainages. The primary soils are deep and moderately deep with very gravelly sandy loam to silt loam textures with a surface volcanic ash layer on the northerly aspects. They are classified as Typic Dystrochrepts, Lithic Dystrochrepts, Andic Dystrochrepts, and Typic Ustochrepts. The dominant potential natural vegetation are the western redcedar, grand fir, and Douglas-fir series.

The subalpine landscapes are located on the mid to high elevation sites. The dominant slopes are 20 to 50 percent with extremes from 10 to 80 percent. These landscapes have glacial cirques and basins and alpine ridges that are formed in residual bedrock with a surface volcanic ash layer. Rock outcrop, talus, and scree are also common. The primary soils are shallow to moderately deep, very gravelly sandy loams and silt loams. They are classified as Andic Cryochrepts, Lithic Cryochrepts, and Andic Dystrochrepts. The dominant potential natural vegetation is the subalpine fir series.

Compiled By: Kootenai National Forest; L.J. Kuennen, Soil Scientist