

LANDTYPE ASSOCIATIONS
OF THE
NORTHERN REGION,
A FIRST APPROXIMATION

COMPILED BY
GARY L. FORD
C. LEE MAYNARD
JOHN A. NESSER
DEBORAH S. PAGE-DUMROESE

PREPARED IN COOPERATION WITH THE
SOIL SCIENTISTS OF THE NORTHERN REGION

USDA FOREST SERVICE

September 8, 1997

COMPILERS/EDITORS

Gary L. Ford is a soil scientist with the Idaho Panhandle National Forests in Coeur d'Alene, Idaho. During this project he was Regional Soil Management Specialist with the Forest Service Northern Region. He holds a B.S. and M.S. in Earth Sciences and a Ph.D. in Soil Science from Montana State University. His primary responsibilities while working for the Regional Office included soil/Ecological Unit Inventory correlation and Regional coordination of soil management and monitoring activities.

C. Lee Maynard is a Soil Scientist/GIS Analyst with the Natural Resources Conservation Service, Helena, Montana. She holds a B.S. in Forest Ecology from Utah State University and an M.S. in Forest Ecology/Soils from the University of Montana. During this project she was the East Zone Ecological Mapping Coordinator for the Northern Region and was responsible for coordinating the production of the electronic mapping and publication.

John A. Nesser is Regional Soil Scientist with the Forest Service Northern Region in Missoula, Montana. He holds a B.S. in Geography and an M.S. in Resource Management (Soils) from the University of Wisconsin-Stevens Point. His primary responsibilities include management of the Regional soils program and ECOMAP/Ecological Unit Inventory coordination.

Deborah S. Page-Dumroese is a Research Soil Scientist with the Intermountain Research Station in Moscow, Idaho. She holds a B.S. in Natural Resource Management from Grand Valley State University, an M.S. in Forest Soils from Michigan Technological University, and Ph.D. in Forest Soils from the University of Idaho. Her main research focus is on maintaining longterm soil productivity after timber harvesting and site preparation.

ABSTRACT

This document describes the Landtype Associations that have been developed for National Forest land in the Northern Region. Map units were delineated at a scale of 1:100,000 and are differentiated by dominant categories of landforms and geologic materials. Descriptions of the seventy one Landtype Associations were prepared for the nineteen Sections that occur in Region 1 using the National Hierarchy of Ecological Units. A total of 40,392,207 acres were mapped. Examples of applications using landtype associations are also presented. These landtype associations were developed primarily for use in landscape and watershed characterization. A geo-referenced, electronic version of the mapping was prepared as a component of this mapping project.

Key Words: landtype associations, National Hierarchy of Ecological Units, landforms, geologic materials

PREFACE

Acknowledgments

Many people contributed their knowledge to this project. Their names are listed below with their area of expertise.

Mapping and Map Unit Descriptions

Skip Barndt, Soil Scientist, Lolo NF
Bill Basko, Soil Scientist, Flathead NF
Jeff DiBenedetto, Ecologist, Custer NF
Pat Green, Soil Scientist/Ecologist, Nez Perce NF
Annie Greene, Soil Scientist, Beaverhead-Deerlodge NF
Frank Heisner, Soil Scientist, Custer NF
Lou Kuennen, Soil Scientist, Kootenai NF
Larry Laing, Zone Soil Scientist, Helena and Lewis and Clark NFs
John Lane, Soil Scientist, Custer NF
Ken McBride, Soil Scientist, Bitterroot NF
Lee McConnel, Soil Scientist, Custer NF
Jim Mital, Soil Scientist/Ecologist, Clearwater NF
Jerry Niehoff, Soil Scientist, Idaho Panhandle NFs
Barbara Pitman, Geologist, Custer NF
Dave Ruppert, Soil Scientist, Beaverhead-Deerlodge NF
Richard Saunders, Soil Scientist, Lewis and Clark NF
Neal Svendsen, Soil Scientist, NRCS
Dean Sirucek, Soil Scientist, Flathead NF
Henry Shovic, Soil Scientist, Gallatin NF
Bob Spokas, Soil Scientist, NRCS
Robin Strathy, Geologist, Lewis and Clark NF
Bo Stuart, Hydrologist, Helena NF
Dan Svoboda, Soil Scientist/Ecologist, Beaverhead-Deerlodge NF
Dale Wilson, Soil Scientist, Clearwater NF (retired)

Geographic Information Systems:

The Natural Resources Information System
of the Montana State Library, Helena

Duane Lund
Peter Langen
Fred Gifford

Geomorphic Overview and Geologic Materials

Jim Sheldon, Regional Geologist, R-1
Jeff Silkwood, Geologist, R-1

Cartography

Ted Nyquest, Idaho Panhandle NFs

Photograph Credits

Robin Strathy, Larry Laing, Jerry Niehoff, Gary Ford, Ken McBride,
Pete Bengueyfield, Pat Green, Dean Sirucek, Dan Svoboda, John Lane,
and Jack Coyner.

TABLE OF CONTENTS

Chapter 1	Purpose, Applications, Mapping Methodology, and Limitations of the Landtype Association Mapping
Chapter 2	Mapping Differentia and Legend
Chapter 3	LTA Descriptions for Section 331A Palouse Prairie
Chapter 4	LTA Descriptions for Section M331A Yellowstone Highlands
Chapter 5	LTA Descriptions for Section M332A Idaho Batholith
Chapter 6	LTA Descriptions for Section M332B Bitterroot Valley
Chapter 7	LTA Descriptions for Section M332C Rocky Mountain Front
Chapter 8	LTA Descriptions for Section M332D Belt Mountains
Chapter 9	LTA Descriptions for Section M332E Beaverhead Mountains
Chapter 10	LTA Descriptions for Section M332G Blue Mountains
Chapter 11	LTA Descriptions for Section M333A Okanogan Highlands
Chapter 12	LTA Descriptions for Section M333B Flathead Valley
Chapter 13	LTA Descriptions for Section M333C Northern Rockies
Chapter 14	LTA Descriptions for Section M333D Bitterroot Mountains
Chapter 15	LTA Descriptions For Sections With Limited Acreages Of National Forest Land
	251A Red River Valley
	251B North Central Glaciated Plains
	331D Northwestern Glaciated Plains
	331E Northern Glaciated Plains
	331F Northwestern Great Plains
	331G Powder River Basin
	M331B Big Horn Mountains
	342A Bighorn Basin

Appendices

Appendix A: The National Hierarchy of Ecological Units

Appendix B: Geomorphic Overview of the Northern Region

Appendix C: Acreage by Landform Groups

Appendix D: Acreage by Geologic Material Group

Appendix E: Acreage of Landtype Associations for entire mapping area

Appendix F: Acreage and proportionate extent of LTAs by Section

Appendix G: Legend by geologic material and landforms

Appendix H: List of common and scientific names for vegetation

Appendix I: Glossary

Appendix J: References

List of Figures

- 1 Map showing Northern Region and areas for which LTAs were mapped
- 2 Map showing abundance of major landform groups
- 3 Map showing abundance of major geologic material groups
- 4 Map showing zones of metamorphism for Belt Series

- 5 Map showing location of 331A within the Northern Region
- 6 Landscape photograph Section 331A, Clearwater NF
- 7 Map showing distribution of LTAs within 331A
- 8 Bar chart showing abundance of landform groups within 331A
- 9 Bar chart showing abundance of geologic material groups within 331A

- 10 Map showing location of M331A within the Northern Region
- 11 Landscape photograph Section M331A, Yellowstone NP
- 12 Map showing distribution of LTAs within M331A
- 13 Bar chart showing abundance of landform groups within M331A
- 14 Bar chart showing abundance of geologic material groups within M331A

- 15 Map showing location of M332A within the Northern Region
- 16 Landscape photograph M332A, Bitterroot NF
- 17 Map showing distribution of LTAs within M332A
- 18 Bar chart showing abundance of landform groups within M332A
- 19 Bar chart showing abundance of geologic material groups within M332A

- 20 Map showing location of M332B within the Northern Region
- 21 Landscape photograph Section M332B, Bitterroot NF
- 22 Map showing distribution of LTAs within M332B
- 23 Bar chart showing abundance of landform groups within M332B
- 24 Bar chart showing abundance of geologic material groups within M332B

- 25 Map showing location of M332C within the Northern Region
- 26 Landscape photograph Section M332C, Glacier NP
- 27 Map showing distribution of LTAs within M332C
- 28 Bar chart showing abundance of landform groups within M332C
- 29 Bar chart showing abundance of geologic material groups within M332C

- 30 Map showing location of M332D within the Northern Region
- 31 Landscape photograph Section M332D, Helena NF
- 32 Map showing distribution of LTAs within M332D
- 33 Bar chart showing abundance of landform groups within M332D
- 34 Bar chart showing abundance of geologic material groups within M332D

- 35 Map showing location of M332E within the Northern Region
- 36 Landscape photograph Section M332E, Deer Lodge-Beaverhead NF
- 37 Map showing distribution of LTAs within M332E
- 38 Bar chart showing abundance of landform groups within M332E
- 39 Bar chart showing abundance of geologic material groups within M332E

- 40 Map showing location of M332G within the Northern Region
- 41 Landscape photograph Section M332G, Nez Perce NF
- 42 Map showing distribution of LTAs within M332G
- 43 Bar chart showing abundance of landform groups within M332G
- 44 Bar chart showing abundance of geologic material groups within M332G

- 45 Map showing location of M333A within the Northern Region
- 46 Landscape photograph Section M333A, Idaho Panhandle Forests
- 47 Map showing distribution of LTAs within M333A
- 48 Bar chart showing abundance of landform groups within M333A
- 49 Bar chart showing abundance of geologic material groups within M333A

- 50 Map showing location of M333B within the Northern Region
- 51 Landscape photograph Section M333B, Flathead NF
- 52 Map showing distribution of LTAs within M333B
- 53 Bar chart showing abundance of landform groups within M333B
- 54 Bar chart showing abundance of geologic material groups within M333B

- 55 Map showing location of M333C within the Northern Region
- 56 Landscape photograph Section M333C, Flathead NF
- 57 Map showing distribution of LTAs within M333C
- 58 Bar chart showing abundance of landform groups within M333C
- 59 Bar chart showing abundance of geologic material groups within M333C

- 60 Map showing location of M333D within the Northern Region
- 61 Landscape photograph Section M333D, Idaho PanhandleNFs
- 62 Map showing distribution of LTAs within M333D
- 63 Bar chart showing abundance of landform groups within M333D
- 64 Bar chart showing abundance of geologic material groups within M333D

- 65 Landscape photograph Section 251A, Custer NF
- 66 Bar chart showing abundance of landform groups within 251A
- 67 Bar chart showing abundance of geologic material groups within 251A
- 68 Bar chart showing abundance of landform groups within 251B
- 69 Map showing location of Great Plains minor units
- 70 Bar chart showing abundance of geologic material groups within 251B

- 71 Map showing location of Section 331D within the Northern Region
- 72 Bar chart showing abundance of landform groups within 331D
- 73 Bar chart showing abundance of geologic material groups within 331D
- 74 Map showing location of Section 331F within the Northern Region
- 75 Landscape photograph Section 331F, Custer NF
- 76 Bar chart showing abundance of landform groups within 331F

- 77 Bar chart showing abundance of geologic material groups within 331F
- 78 Map showing location of Section 331G within the Northern Region
- 79 Landscape photograph Section 331G, Custer NF
- 80 Bar chart showing abundance of landform groups within 331G
- 81 Bar chart showing abundance of geologic material groups within 331G

- 82 Map showing location of M331B within the Northern Region
- 83 Landtype Association Legend (Part A)
- 84 Landtype Association Legend (Part B)
- 85 Index Map of 1:100,000 scale quadrangle maps
- 86 Landscape photograph Section M331B, Custer NF
- 87 Bar chart showing abundance of landform groups within M331B
- 88 Bar chart showing abundance of geologic material groups within M331B
- 89 Map showing location of 342A within the Northern Region
- 90 Bar chart showing abundance of landform groups within 342A
- 91 Bar chart showing abundance of geologic material within 342A

- 92 Map showing geomorphic overview of Northern Region
- 93 Map showing Subsection Level of Ecological Units for Region 1
- 94 Map showing Colored Relief, Sections and Subsections for Region 1

Chapter 1

PURPOSE, APPLICATIONS, METHODS AND LIMITATIONS

PURPOSE:

The intent of this project was to develop a set of 1:100,000 scale maps differentiating the dominant combinations of landforms and geologic materials (bedrock and surficial) that occur on Forest Service lands throughout northern Idaho, Montana, and North Dakota (Figure 1). Some areas of other ownership are included. Map unit delineations were based on a uniform legend and map unit descriptions were prepared for each of the landtype associations (LTAs) accounting for variability between Sections. The project also incorporated the use of a Geographic Information System to develop a continuous, geo-referenced electronic version of the mapping.

This report reflects our first attempt to translate on-the-ground knowledge into the landscape scale of the National Hierarchical Framework of Ecological Units (ECOMAP, 1993). (See Appendix A for a summary of this hierarchy). These maps and descriptions are a first approximation of the landtype associations of the Northern Region. Each time the landtype association maps and descriptions are refined the quality of these products will be enhanced.

Previous ecological unit mapping has been completed at the Section (Bailey and others 1994a) and Subsection levels (Nesser and others 1997) for the Northern Region. It is recommended that the reader be familiar with these documents before using this one. Landtype associations further refine the characterization of landscapes from Sections and Subsections into units that describe the composition of landscapes by similarities and repeatable patterns in landforms, their dominant formative processes, and underlying geologic materials.

The display of mapped information is not inclusive of all known geomorphic categories, nor (due to the mapping scale) is it precisely site specific. The incorporation of a conceptual ecological hierarchy into geo-referenced delineations requires many interpretive iterations; each at a more refined scale and level of resolution.

A decision was made to limit this report to the mapping and characterizations of the LTAs. Interpretations evolve and change, which can make documents such as this obsolete in a short period of time. For this reason, this report will only briefly discuss some of the general interpretations and applications which are appropriate to make using this information. For a more detailed discussion of site specific interpretations for LTAs and local soil monitoring results refer to Forest level landscape assessment documents or SOLO (Rice, et al. 1997).

APPLICATIONS OF THE LANDTYPE ASSOCIATION MAPPING

This mapping is the best single source of information on the soils of the Northern Region. It can be used by itself to gain an understanding of landforms and geologic materials throughout the Northern Region, or in combination with other landscape attributes such as vegetation to support a wide range of landscape level characterizations. The inherent features of map units such as the LTAs, which depict the geomorphic environment, generally do not change with management activities so they can be used as a template for examining the existing conditions of the land (vegetation, wildlife, etc) which are subject to change by management or by natural disturbances (Bailey 1994b).

Landtype associations can be developed for a variety of interpretive purposes. These Regional LTAs were developed primarily to support landscape level characterization of watershed properties important to management. The use of landforms and geologic materials as mapping differentia for this purpose is based on the assumption that these are features which can be mapped consistently at the landscape level, and that closely predict significant differences in watershed, stream, and riparian properties. In addition to watershed characterization, the LTA's can be appropriately used to assist with a variety of landscape level analyses and interpretations.

The primary utility of this mapping is its use as a stratification tool for analyzing locations with similar geomorphic attributes and the landscape properties that these attributes control and influence. When used in conjunction with the Section and Subsection levels of the ecological mapping hierarchy, LTA information can also display the distribution and extent of landform/geologic material groups within regionally specific climatic and geographic zones.

Fundamental to the appropriate use of the LTA's is an understanding of the ecological processes controlled and influenced by geomorphic properties. These include: the physical and chemical properties of soils (ie. soil texture and nutrient status); erosional characteristics; and hydrologic basin morphometrics. As more is learned about biophysical influences on ecological processes other relationships will undoubtedly emerge.

Geologic material plays a dominant role in controlling topographic relief, the development of landforms, and their distribution across landscapes. Landforms, combined with surficial parent material and other environmental factors such as climate, greatly influence the textural classes and nutrient status of the soils that develop. Knowledge of the dominant textural class of soils is necessary for predicting erosional and depositional characteristics. The extent and distribution of various kinds of soils influences the extent and distribution of vegetation. The nutrient status of the soil plays a significant role in influencing the growth rates and vigor of vegetation.

The distribution and extent of dominant landforms greatly determines the physiographic features of hydrologic basins. Basin morphology influences the distribution and extent of unique valley types, riparian and wetland characteristics, and stream channel properties. The extent and distribution of unique stream types within any watershed (classified by width/depth ratios, particle size distribution, cobble embeddedness, etc.) are closely correlated with the unique landform/geologic material combinations that are expressed.

Using a Geographic Information System (GIS) and the knowledge of inherent biophysical landscape relationships, a variety of models have been developed to provide additional attributes to portions of the LTA map theme. The inherent and derived attributes have been used to characterize and classify landscape level ecological units and watersheds throughout the Region. The following examples are included to illustrate some of these applications for specific projects throughout the Region:

Mass Wasting/Erosion Potential: To develop this interpretation, each LTA polygon is further attributed with a minimum, maximum, and mean slope value from 30 meter resolution Digital Elevation Models (DEMs). In addition, each LTA map unit is assigned a value for erodability based on research results for each dominant parent material/soil category. The range of slope attributes combined with dominant surface and subsurface soil texture values within unique precipitation zones are then evaluated for potential surface erosion and mass wasting.

Valley/Stream Type: Delineations of dominant valley types are inherent in the mapping. Other less prominent valleys and drainages are included as components or inclusions of many other LTA's. These can be identified using the LTA map unit descriptions and can also be displayed visually by using the streams data and DEMS for any given location. The composition of valley bottom types within each LTA is commonly within a fairly narrow range, controlled by the climatic zone and structural properties of the unit. More refined distinctions of valley and stream types within each map unit delineation can be derived by developing distinct slope categories (based on the DEMs) and assigning those to each stream segment. Stream segments, when assigned an LTA attribute to assist with the characterization of dominant width/depth ratios, particle size distribution and other parameters controlled by landform/geologic material can be more readily classified. Reasonable predictions for stream sinuosity and Rosgen stream type can also be derived for streams within each LTA map unit using calculations that combine attributes of the topography and drainage patterns.

Stream Density/Dissection: A drainage density attribute can be calculated for each LTA by dividing the sum of the length of all streams per LTA polygon by the total area per LTA to derive stream miles per square mile of map unit. This drainage density ratio can be used to evaluate landscapes for sediment delivery potential to streams in varying geographic locations.

Sediment Production and Delivery: Using the slope, dominant surface texture and stream density variable for each LTA polygon, an interpretation can be made for predicting a generalized range of values for inherent sediment production and delivery potential for each map unit or combinations of units within a watershed. To compare existing watershed sedimentation conditions with natural sedimentation, additional information representing vegetation and disturbance patterns must be included as steps in the analysis.

MAPPING METHODS:

The geo-referenced electronic data to accompany this mapping project was created using two primary techniques. In the first, each Forest Soil Scientist drafted landform/geologic material delineations on 1:100,000 scale stable base contour maps. A professional cartographer then transferred these delineations onto a mylar base registered to the stable contour base map. Each 1:100,000 quadrangle was edge-matched with the adjacent quads during the drafting procedure. The archival mylar base maps were then electronically scanned at 400 dpi to create a geo-referenced digital file. This drawing was then transferred into the appropriate coordinate system (Albers Equal Area Projection) for the 1:100,000 scale quadrangles. A registration error of .007 was accepted as a maximum. Polygon topology was built for each coverage and a Landtype Association attribute assigned to each polygon. Individual quads were then electronically edge-matched and joined into draft coverages for larger geographic areas. This method was employed for those Forests that did not have complete landtype level mapping available. These included the Idaho Panhandle, Bitterroot, and Deerlodge Forests.

The second technique used for creating the LTA coverage was applied to those locations where existing electronic coverage of the 1:24,000 scale Landtype (Order 3 Soil Survey) mapping was available. In this situation, an LTA attribute was added to the coverage and each landtype polygon was assigned to the appropriate landform/geologic material category of the Region 1 legend. The resulting polygon coverages were then dissolved on the LTA attribute to display the broader delineations, and were ultimately joined with mapping for the adjacent Forests.

In both situations, numerous iterations of draft plots of the linework were

sent to the mappers for review, corrections and additional edge matching. A final correlation of the mapping was then conducted using final draft maps, tables of acreages calculating the extent and distribution of all units, and accessory attribute information. The final resulting coverage was then associated with the electronic version of the Section and Subsection mapping to assign the appropriate upper level identifier to each LTA polygon. The electronic coverage now available represents the last corrected update of this mapping. The final Regional LTA coverage contains over 33,415 LTA polygons covering an area of 40,392,207 acres.

Hard copy versions of the mapping for each 1:100,000 scale quadrangle can be plotted using the map compositions that are included on this CD.

Throughout the Landtype Association mapping project, Geographic Information System (GIS) hardware, software, and technical expertise were provided through a cooperative agreement with the Natural Resource Information System (NRIS) of the Montana State Library. Digital data were processed using a SPARC 20 UNIX workstation running Version 7.04 of the ARC-INFO program. The LTA coverage can be retrieved from the Management Systems Group of Region 1.

LIMITATIONS OF THE MAPPING

As with any map product, the basic principles of scale apply to the LTA mapping. The Landtype Associations provided in this publication were compiled at a scale of 1:100,000 and should be used for stratification purposes only at larger scales such as 1:24,000.

The Sections were mapped at 1:1,000,000; the Subsections at 1:500,000. For this reason when displayed in relationship to the LTA's their boundaries are only approximately located. Section and Subsection delineations were electronically incorporated into the LTA coverage for referencing and attributing purposes only. The upper level delineations were not adjusted to the 1:100,000 map scale in the GIS processing resulting in 'slivers' that are artifacts of combining information generated at different scales. Consequently, data summaries may show some LTAs as occurring in one Section or Subsection which may actually occur in the adjacent unit. Future refinements of all levels of the ecological mapping will provide the opportunity to adjust these delineations. Time constraints prohibited that from occurring in this first approximation.

At the present time, geologic mapping is incomplete in some areas. While this LTA mapping used the best available geologic information, it will be possible to improve the landtype associations as new geologic maps become available.

This project was initiated to map Landtype Associations on National Forest land and is not intended to be the primary source of information for other ownerships. Readers desiring information on private land should consult their local Natural Resource Conservation Service office. Where Bureau of Land Management, National Park Service, or Tribal lands are of interest, contact their nearest office for information.

The authors of this document and compilers of the map series realize that there may be errors due to time or information constraints that we have failed to recognize and correct. Users of this information are encouraged to submit corrections to the Regional Soil Scientist for incorporation into the second approximation.

Chapter 2

MAPPING DIFFERENTIA AND LEGEND

Map Unit Differentia:

At the Landtype Association level, ecological units delineations incorporate the intended use of the map; features used to delineate polygons are referred to as the differentiating criteria. The differentiating criteria for the LTA mapping were the dominant types of landforms and geologic materials that occur on National Forest lands in the Northern Region. The landform and geologic material groups that were used in the mapping are described in the following sections.

Other attributes (accessory characteristics) are also described for each map unit, but were not used as delineation criteria. Accessory characteristics described for the LTA's include: elevation range, slope range, average annual precipitation, surface and subsoil textures and rock fragment contents, stream pattern and density, soil taxa at the subgroup level, and potential vegetation at the series level.

The legend that was developed for the LTA mapping project was designed to cover the major types of landforms and geologic materials that occur throughout the Northern Region. Where differences in landform or geologic materials occurred, they were separated into the landform groups, rock types, or weathering classes listed in the legend.

In some areas, such as the continentally glaciated Belt rocks, the geology is relatively simple and it was possible to prepare a single map unit description for each LTA that occurred in a Section. Where the geology is more complex, it was not possible to do this. In these cases, Subsections were used as the basic template for separating differences in LTAs. If a Section had occurrences of the same general landform and geologic type but with very different accessory characteristics (soils, climate, potential vegetation), the preferred way of addressing these differences was to separate the Map Unit Descriptions (MUD's) by Subsection.

General Discussion of the Landform Groups

The following fifteen major landform groups were used in the mapping of LTAs. See Figure 2 for a display of their general occurrence throughout the Region. Appendix C contains the acreage figures for landform groups.

- Valleys
- Breaks
- High Relief Mountain Slopes
- Steep Glaciated Mountain Slopes
- Glaciated Mountain Slopes
- Mountain Slopes and Ridges
- Frost Shattered Mountain Ridge Tops
- Low Relief Hills
- Mass Wasted and Colluvial Slopes
- Glaciated Plains
- Sedimentary Plains
- Badlands
- Glaciolacustrine Plains
- Erosional Plateaus and Buttes
- Hills and Plateaus

Eroded Uplands

These landform groups are described below using the following criteria:

- 1) Primary landforms
- 2) Process of development
- 3) Slope gradient
- 4) Surface shape
- 5) Associated landforms

VALLEYS: The primary landforms included in this unit are floodplains, terraces, and alluvial basins formed by recent streams or by glacial meltwater. A variety of water-deposited sediments occur in these valleys. The alluvial deposits vary from poorly sorted and stratified to well sorted and stratified; some dune deposits also occur. These units typically have straight or convex slopes that range in gradient from 0 to 30 percent. They may also contain narrow terrace escarpments which can be much steeper. The surface shape typically is level to very gently rolling. Associated landforms include both glaciated and unglaciated mountain slopes and gently to moderately sloping hills. Due to the scale of the mapping only major valleys are delineated. Smaller valleys and drainages are described as components of other map units.

BREAKS: In the Northern Region these are frequently referred to as breaklands. The more commonly accepted term of Breaks is used in this publication. The two main types mapped were structural breaks and stream breaks. The primary landforms included in this unit are breaks and escarpments. These generally have straight slopes in excess of 60 percent, with a slope range from 50 to greater than 100 percent. Breaks typically have abrupt changes to gentler slopes with the adjacent landforms. These landforms have developed by tectonic activity and/or rapid stream downcutting processes. In some places they have been modified by glacial action. Associated landforms include mountain slopes and ridges, and alluvial valley floors. These units occur primarily in western Montana and north Idaho.

HIGH RELIEF MOUNTAIN SLOPES: Unglaciated mountain slopes of high relief. In general, an elevational change of greater than 244 meters (800 feet) is common to these units. Slope gradients are greater than 40 percent. These units were primarily mapped east of the Continental Divide.

STEEP GLACIATED MOUNTAIN SLOPES: The primary landforms included in this unit include cirque headwalls, glacial troughwalls, alpine ridges and cirque basins. These landforms are predominantly formed by alpine glacial erosion processes but include areas of glacial deposition. Due to the scale of the mapping and the close physical association of these landforms, they were combined into a single map unit. Cirque headwalls and glacial troughs typically have straight or concave slopes that range in gradient from 50 to greater than 100 percent. Alpine ridges have convex slopes ranging from 10 to 40 percent. Cirque basins are typically bowl-shaped landforms with gradients from 0 to 30 percent.

Associated landforms include gentle to moderately sloping glaciated lands, mountain ridge tops, and valley floors. This steep glaciated map unit has characteristics similar to the gentle to moderately sloping glaciated land produced by continental glaciation; however that unit typically has more subdued topography and occurs at lower elevations. This unit also includes broad, ice-cap ridges having less than 40 percent slopes and equal amounts of subdued glacial erosion and deposition. These units were mapped throughout the mountainous areas of the Region.

GLACIATED MOUNTAIN SLOPES: The dominant landforms include glacial moraines, glaciated mountain slopes, and glaciated mountain ridetops. These landforms

represent depositional and erosional surfaces formed primarily by continental glaciation with some areas modified by alpine glaciers. These surfaces have subdued relief with rolling topography. They are a combination of eroded, convex ridges, glacial deposits on slightly concave valley sideslopes, and deep glacial deposits on valley floors. Slope gradients range from 15 to 50 percent. Associated landforms include gentle to moderately sloping frost shattered ridges and sideslopes, steep glaciated lands, and glacial outwash and glaciolacustrine landforms. These were mapped primarily in northwest Montana and north Idaho.

MOUNTAIN SLOPES AND RIDGES: The primary landforms are ridges and sideslopes that have formed by fluvial and colluvial processes. The ridges are generally convex and the sideslopes are straight. Slope gradients generally range from 20 to 65 percent with 35 to 60 percent being dominant. A variety of weathering classes are expressed. Infrequent small nivalational basins are included. Associated landforms are valley floors, and steep glaciated lands where alpine glaciers have been active at higher elevations. Some broader ridges may also occur where frost action has occurred. These were mapped throughout the Region south of the continentally glaciated areas.

FROST SHATTERED MOUNTAIN RIDGETOPS: The mountain ridge top is a broad convex landform that commonly occurs above mountain slopes and adjacent to steep glaciated lands. They have formed mainly by physical weathering and periglacial frost shattering. They are usually undissected. Slope gradients range from 5 to 40 percent. As mapped, these landforms can include small areas of weak glacial erosion and deposition. The geologic materials commonly have a high rock fragment content which has been loosened and mixed by frost action and other weathering processes. Rock outcrops are infrequent. Frost shattered mountain ridge tops were mapped primarily at higher elevations in western Montana and north Idaho.

LOW RELIEF HILLS: This group consists primarily of low relief hills (less than 100 meters) with lesser amounts of alluvial fans, terrace remnants and colluvial slopes. These landforms are the result of shallow stream dissection of deeply weathered surfaces. They are frequently protected from deep dissection by nick points. Slope gradients are generally less than 45 percent with a typical range of 20 to 40 percent. Surface shape consists of simple to complex slopes of all shapes. Associated landforms are recent terraces and fans, hills and mountain slopes, deep frost shattered ridges, and slopes.

MASS WASTED AND COLLUVIAL DEPOSITS: The dominant landforms are rotational and translational failures. Included are a variety of types of failures, such as debris avalanches, slumps, and deep mantle failures. Slope gradients for the translational failures are generally greater than 50 percent and commonly occur on the steep mountain sideslope units, either glaciated or unglaciated. Rotational failures generally occur on lower slope gradients on the gently to moderately sloping mountain sideslope units, either glaciated or unglaciated. Associated landforms, in addition to the mountain sideslope units, are ridge tops at higher elevations and valley floors at lower elevations. Generally small in size (less than 50 acres), these units may also occur as inclusions in other landform groups.

GLACIATED PLAINS: The primary landforms in this unit include glaciated rolling plains and glaciated dissected plains. These landforms resulted from the deposition of glacial till from continental glaciation, and also by lacustrine and deltaic sediments from glacial lakes. Glaciated rolling plains consist of hills and swales or slightly dissected, slightly entrenched drainageways. Slopes are usually less than 15 percent and relief is less than 200 feet. Glaciated dissected plains consist of hills and moderately to strongly dissected and entrenched drainageways. Slopes are usually 15 to greater than 40 percent and relief is usually greater than 60 meters

(200 feet). Associated landforms include sedimentary rolling and dissected plains, breaks, and valleys. Glaciated plains were mapped on the Custer National Forest.

SEDIMENTARY PLAINS: The primary landforms in this unit include rolling plains and dissected plains. These units have formed in sandstone and shale sediments as a result of chemical and physical weathering, fluvial and colluvial processes. Rolling plains consist of hills and swales or slightly dissected, slightly entrenched drainageways. Slopes are usually less than 15 percent and relief is less than 60 meters (200 feet). Dissected plains consist of hills and moderately to strongly dissected and entrenched drainageways. Slopes are usually 15 to greater than 40 percent and relief is usually greater than 200 feet. The surfaces are level to steep with slopes usually less than 45 percent. Associated landforms include glaciated rolling plains, glaciated dissected plains, badlands, breaks and valleys. Sedimentary plains were mapped on the Custer National Forest.

BADLANDS: The primary landforms in this unit include hills, knobs, alluvial fans, ridges and drainageways. These landforms have developed from erosion caused by infrequent heavy showers on sparsely vegetated landscapes. This has resulted in rough, narrowly and steeply gullied topography where soft bedrock of shale and sandstone are widely exposed. Runoff is very rapid and permeability is very slow. Little true soil development has taken place and erosion is active. Vegetation is limited to bottoms of draws, smooth benchlike areas, or gentle slopes where soil can form or has not been eroded. The surfaces are sloping to steep. Slope gradients range from 5 to greater than 45 percent. Associated landforms include rolling plains, dissected plains, and valleys. Badlands were mapped on the Custer National Forest.

GLACIOLACUSTRINE PLAINS (Deltaic Plains/Eolian Deposits): The primary landforms include glacial lake deltaic deposits, sandhills and dunes. These landforms developed from the deposition of sediments at the mouth of the Sheyenne River as it discharged into glacial Lake Agassiz which filled the Red River Valley of North Dakota and Minnesota. The deltaic deposits consist of very fine to fine grained sand, a transition zone of interbedded silt and sand and silt and clay. The sands were then redistributed and moved by the wind into the dunelike topography presently in the area. Glacial lake deltaic deposits consist of nearly level hills and swales. Slopes are usually less than 5 percent and relief is less than 3 meters (10 feet). Sandhills and dunes consist of hills, dunes and hummocks that are slightly dissected, and slightly entrenched. Slopes are usually 5 to 20 percent and relief is usually less than 25 feet. Associated landforms include valleys. Glaciolacustrine deltaic plains and eolian deposits were mapped on the Custer National Forest.

EROSIONAL PLATEAUS AND BUTTES: The primary landforms in this unit include nearly level to flat topped summits and relatively steep slopes or cliffs. These landforms were formed as a result of erosion by water. The landforms are a remnant of a higher surface and are typically capped with erosion resistant rocks. The summits are nearly level to flat with slopes from 0 to 12 percent. The steep slopes often contain rubble and talus and slope gradients are 25 to greater than 90 percent. Associated landforms are rolling and dissected plains, badlands, and valleys.

HILLS AND PLATEAUS: The plateaus are associated with flows of Columbia River basalt. The hills are usually associated with deposits of wind blown loess. Hills and plateaus were mapped on the Clearwater National Forest.

ERODED UPLANDS: These areas are transitional between higher elevation plateaus and lower elevation plains. They are not as gullied, can have more relief, and have more vegetation than the badlands. The primary landforms in

this unit include ridges, plateau remnants, hills, and drainages. These landforms were formed by stream erosion. Plateau remnants are nearly level to flat. Ridges and hills have straight to concave steep slopes. Slopes generally range from 15 to 60 percent. Associated landforms are plateaus, dissected plains, and valleys. Eroded uplands were mapped on the Custer National Forest.

General Discussion of Geologic Material Groups

Twelve geologic material groups were used for the Landtype Association mapping and are listed below:

- Schists and Gneisses (usually weakly or moderately weathered)
- Metasedimentary (Belt) (vary with degree of metamorphism)
- Quartzites (frequently mapped with schists and gneisses)
- Sandstones and Shales
- Carbonates
- Granitics (weakly, moderately and highly weathered classes)
- Volcanics
- Calc-silicates
- Loose Sediments
 - Fine Sediments: lacustrine, ash and loess
 - Coarse Sediments: till, wind deposited sand, talus

These groups are briefly summarized below. See Figure 3 for a small scale map showing their distribution throughout the Region. Appendix D contains the acreage figures for the geologic material groups.

SCHIST AND GNEISS: This includes all schists and gneisses in the Region regardless of age or origin. Included are the Archean basement rocks (about 2.8 billion years old) exposed in the Beartooths, the metamorphosed Belt rocks of Zone 3 (described in the Belt section which follows) and the rocks which occur in the Western Idaho Suture Zone (WISZ). This is a zone of intensely metamorphosed rocks that started as Belt or granitics and are now gneisses and schists. During this process the rocks were mechanically abused as well, resulting in a weak broken material subject to deep chemical weathering, shot through with planes of failure and resulting in erosive weathering products such as grus or fine micaceous sand. The old term for this area was 'Border Zone', when it was thought to be the result of intrusion of the Idaho Batholith. The change to WISZ reflects a newer understanding that in addition to the effects of the batholith, this is the collision zone where Washington and Oregon docked when they were added to the Idaho coast. Throughout this area schists, gneisses and quartzites are mapped together.

METASEDIMENTARY (Belt): The Belt Supergroup is the bedrock of about 65 percent of the Northern Region. Because of its complex history these rocks assume a wide variety of lithologies and appearances. Many of these are described here under other categories, such as calc-silicates, WISZ, schists and gneisses depending on their metamorphic grade. For this document, Belt is defined as that portion of the Belt lithology that is dominated by alternating thin beds of argillite, siltite, and quartzite. It includes thick carbonate units at the bottom and in the middle. It also includes large dark colored intrusives shot in along bedding planes. This occurs most commonly in the lower, older rocks. The Region is divided into three zones based on metamorphic grade (see Figure 4).

In the extreme east is Zone One, extending from the Little Belts east and northward. This is the least metamorphosed area of the Belt basin with the rocks being only slightly altered and much more like sedimentary rocks.

Zone Two makes up the bulk of the Region extending to the Idaho line near Missoula to Coeur d'Alene and northward. In this zone the rocks are harder.

Slaty cleavage shows but they are still recognizable as sediments.

Zone Three extends to near Orofino, Idaho where it merges into the Western Idaho Suture Zone (WISZ) explained below. These rocks are where sediments begin to turn into schist and gneiss and become increasingly hard to recognize as sediments. Belt time spans the period of 2.2 billion to about 850 million years ago.

QUARTZITES: Refers to the Flathead Formation where it is a quartzite, and the Quadrant Formation. The Flathead lies atop the Belt rocks on a regional scale unconformity. It is early Cambrian in age spanning the time 570 to 550 million years. The Quadrant is Pennsylvanian (about 4000 feet above the Flathead) spanning 320 to 290 million years. Both formations have blocky outcrops, low fertility, and excessively drained sites. They both tend to be resistant ridge formers and nickpoints in the landscape.

SANDSTONES AND SHALES: Refers to all sedimentary strata above the Cambrian not dominated by carbonates, or large quartzite units. This does not include the unindurated Tertiary Sediments. These are the less resistant clastics that underlie rounded hills or are swales in the landscape. Some of the larger sandstones are ridge formers and moderately resistant. These span from 600 million to 1.7 million years. Sandstones and shales occur mostly in central and eastern Montana and in North Dakota.

CARBONATES: Refers to all carbonates, including dolomites, above the Cambrian. The most prominent formations are paleozoic in age including Cambrian Meagher and Pilgrim Formations, and the Devonian aged Three Forks Formation. The largest is the Mississippian Madison Group. These units tend to be resistant ridgeformers. This position in the landscape allows the chemically reactive erosion products to move downslope with gravity, mixing with and adding lime to all the soils below them. Structurally controlled drainages and stable drainageways are features of landscapes in these units. Water chemistry is dominated by carbonate influence. Karst and dramatic water loss from perennial streams is common as are large volume springs. Many thermal springs originate from these formations.

GRANITICS: Refers to all light colored intrusive rocks of any age. Most of these masses date from late Cretaceous to early Tertiary (70 to 55 million). Important properties stem from the fact that they occur as large homogenous masses of equigranular rock made up of minerals with different properties. In moist regimes exposed to soil acids they are very reactive to chemical weathering, while in dry or nonacid regimes are very resistant. This leads to landforms at the ends of the spectrum being made of the same material. Where covered with soil and vegetation, it makes weak, gentle, rounded landforms and is erosive, while where bare it is resistant, fresh, and rugged. This also affects the nature of sediments produced. The weathering product-grus is equigranular, noncohesive, and very erodible and is primarily in the medium to coarse sand range. Fresh material makes cobbles and boulders that persist and are resistant in running water. The granitics occur in north Idaho and western Montana as a number of igneous bodies such as the Idaho, Boulder and Kaniksu Batholiths along with related intrusives.

To maintain uniformity between forests in mapping granitic weathering classes, the system developed by Clayton and Arnold (1972) was used and should be consulted for more information. In the LTA map unit descriptions if granite is listed without a weathering class it is described as unweathered or weakly weathered. Moderate and highly weathered modifiers are used where these classes occur. A brief summary of weathering classes defined in this publication is given below. These definitions were used to classify the degree of weathering of the granitic materials.

Unweathered: This corresponds to class 1 being fresh unweathered material. It is most common in glacially scoured landscapes where it has been protected from vegetation by slope, altitude, or running water. Cracks are fresh and sharp, it rings when hit with a hammer, and crystals are sharp and fresh including the black mica.

Weakly weathered: This corresponds to Classes 2 and 3. It represents the first stages of weathering including features like weak iron stains emanating from the black mica, and the feldspars turning from fresh white or transparent to a cloudy white condition. It gives a duller sound when struck with a hammer.

Moderately weathered: This corresponds to classes 4 and 5 including material that spalls (crumbles) and gives a dull thud when hammered. This material requires a hammer to break and does not generally go directly to grus.

Highly weathered: This corresponds to classes 6 and 7. This covers materials that extend from that which goes directly to grus and can be broken by hand, up to material where feldspars have gone to clay and material that is plastic when wet.

VOLCANICS: Refers to all extrusive rocks regardless of age or composition. The region is bimodal having a lot of lava with minimal silica in it (basalt), containing little ash, scoria or welded material in far ranging flows, or having a lot of ashy welded rocks with abundant silica with short trashy flows intermixed. This leads to the two class definitions:

Basalt dominated: These are the great flood basalts of the Columbia River Plateau. They typically have the flat upper surface of a fluid lava flow. They are deeply dissected by the main trunk streams forming the characteristic stepped breaks controlled by resistant flows. These units also include paleosols and gravel interbeds that are locally important in controlling stability and groundwater. The resistant beds are nickpoints in many drainages. These rocks are alkaline and the groundwater and surface water reflect this. They are Miocene (17 million to 8 million years) in age. The basalts are most abundant in Idaho.

Intermediate composition (andesite-rhyolite) dominated: These rocks are piles of siliceous volcanic rocks that fell out of the air or slid down the sides and were welded into rock by their remaining heat, mixed with lava flows, mudflows, mass failures, and ash falls. They tend toward rounded gentle landforms until flow or solidly welded material approaches 50 percent of the pile; these act as resistant units. The ash typically weathers rapidly to clays. These layers greatly affect stability and act as aquatards for perched aquifers and determine seep horizons. Slumps and landslides are common, even pervasive in many landscapes dominated by these rocks. The andesites and rhyolites are most abundant in Montana.

CALC-SILICATES: These are the mid-Belt carbonates where they have been subjected to metamorphism such that little carbonate remains (Middle Wallace Formation of the Belt Supergroup). Where referred to as dirty carbonates, the carbonate has reacted with soil to become calcium aluminum, or calcium magnesium silicates. There are often zones of schist or gneissic rocks included. The calc-silicates were mapped mostly on the Bitterroot National Forest.

LOOSE SEDIMENTS: This refers to all unindurated material. This is Quaternary to Recent material spanning the last 1.7 million years. This material tends to be bimodal, either predominantly coarse or fine.

Fine grained: (<.25 mm or <60 mesh) This is predominantly sediment deposited in ponded water (lacustrine sediments) or wind deposited ash and loess. The largest expanses are from lakes ponded by ice during the ice ages, or mass failure dams in smaller drainages. This includes fine colluvial material or mass failures in any of this fine grained material. The loess occurs mostly in Idaho, while the volcanic ash occurs in both north Idaho and western Montana. Glacial lake deposits occur in north Idaho and western Montana.

Coarse grained: (>.25 mm or >60 mesh) This includes coarse material deposited by modern streams, glacial meltwater, glacial till and wind deposited sand. Also included are gravity deposits, such as talus or mass failure in coarse materials. An unusual occurrence is that of coarse delta deposits into Lake Missoula in western Montana. The continental till occurs in north Idaho and northwest Montana. Alpine till occurs many high elevation mountainous areas throughout the Region. Areas which were occupied by ice caps or piedmont glaciers occur in western Montana. The sandhills and sand dunes are most abundant on the Custer National Forest.

THE MAP LEGEND

Listed below is the legend used for the mapping. It is organized with the first subdivision being landform and the second being geologic material. The number given is the LTA identifier. For the convenience of the user, Appendix H contains a second version of the legend which is arranged by geologic material first and landform second. Figures 83 and 84 display the legend categories with the colors used on all maps showing the LTAs.

Plains		
	1	Shales, Siltstones and Sandstones
Glaciated Plains		
	2	Shales, Siltstones and Sandstones
Dissected Plains		
	3	Shales, Siltstones and Sandstones
Glaciated Dissected Plains		
	4	Shales, Siltstones and Sandstones
Badlands		
	5	Shales, Siltstones and Sandstones
Eroded Uplands		
	6	Volcanic Tuffs, Shales, Siltstones, and Sandstones
Erosional Plateaus and Buttes		
	7	Shales, Siltstones and Sandstones
Glaciolacustrine Plains		
	8	Glacial Lake Deltaic Sediments
	9	Sandhills and Sand Dunes
Valleys		
	10	Recent Coarse Alluvium
	11	Lacustrine Sediments
	12	Outwash and Other Older Coarse Alluvial Deposits
	13	Fine Glacial Sediments
	14	Recent Fine Alluvium
Hills and Plateaus		
	17	Loess
Breaks		
	20	Metasedimentary (Belts)
	21	Granitics, Highly Weathered
	22	Granitics, Weakly Weathered
	23	Schists and Gneisses
	24	Volcanics
	25	Sandstones and Shales
	26	Gneisses, Quartzites, Schists, Moderately Weathered
	27	Carbonates
	28	Metasedimentary (Dissected Belt Breaks)
	29	Quartzites and Calc-silicates
High Relief Mountain Slopes		
	34	Volcanics
	36	Sandstones and Shales
	37	Carbonates

Steep Glaciated Mountain Slopes		
39	Gneisses, Schists and Associated Metamorphics	
40	Metasedimentary (Belt)	
41	Granitics and Other Coarse Grained Intrusive Rocks	
42	Volcanics	
43	Carbonates	
44	Sandstones and Shales	
46	Alpine Troughs and Troughwalls, Granitics	
47	Alpine Troughs and Troughwalls, Belts	
Glaciated Mountain Slopes		
35	Weakly Glaciated Mountain Slopes and Ridges,	
Calci-silicates	and Quartzites	
45	Weakly Glaciated Mountain Slopes and Ridges, Granitics	
50	Metasedimentary (Belts)	
51	Granitics	
53	Sandstones and Shales	
54	Volcanics	
57	Gneisses, Schists and Associated Metamorphic Rocks	
58	Highly Weathered Belt Till	
Mountain Slopes and Ridges		
59	Gneisses, Quartzites, Schists, Moderately Weathered	
60	Metasedimentary (Belt)	
61	Granitics, Highly Weathered	
62	Granitics, Weakly Weathered	
63	Schists, Gneisses and Associated Metamorphics	
64	Volcanics	
65	Soft Sedimentary Rocks	
66	Carbonates	
67	Quartzites and Calci-silicates	
68	Sandstones and Shales	
69	Pediment, Mixed Geology	
Frost Shattered Mountain Ridge Tops		
70	Metasedimentary (Belt)	
71	Granitics, Highly Weathered	
72	Granitics, Weakly Weathered	
73	Volcanics	
74	Sandstones and Shales	
75	Calc-silicates and Quartzites	
77	Gneisses, Quartzites, Schists, Moderately Weathered	
Low Relief Hills		
80	Metasedimentary (Belt)	
81	Granitics, Highly Weathered	
82	Volcanics	
83	Fine Tertiary Sediments	
84	Schists, Highly Weathered	
85	Gneisses, Quartzites, Schists, Moderately Weathered	
88	Coarse Tertiary Sediments	
Mass Wasted Slopes		
90	Mixed Geology	
Colluvial Slopes		
92	Mixed Geology	
Water		
99	Lakes and Reservoirs	

OVERVIEW OF THE LANDTYPE ASSOCIATION DESCRIPTIONS

The seventeen landform groups and twelve geologic materials groups were combined to produce seventy one Landtype Associations for the Northern Region. Some of these LTAs occur across very large areas and therefore have many differences in accessory characteristics (soils, climate, potential vegetation) which are addressed by identifying and describing each LTA based on the Section in which it occurs.

When an LTA occurred in more than one Section, a separate MUD was prepared for each Section. The exception to this was if an LTA occurred in adjacent Sections and the two occurrences were considered to have similar enough characteristics that one MUD could be prepared to address both Sections. In this case a single MUD was prepared for multiple sections-each identified at the beginning of the MUD. One of the reasons it was possible to write a single MUD to cover the occurrence of an LTA in several Sections is that the higher levels of soil taxonomy (subgroup) and PNV classification (series) were used for the landtype association characterization.

Some Sections have a few landtype associations which occupy large acreages and are clearly the major units; other LTAs in each Section are of lesser acreage and can be considered minor units. LTAs which have very limited acreage may be considered incidental. An LTA can be a major unit in some Sections, a minor unit in others, and incidental or not present in other Sections. The geomorphic complexity of some Sections in the Northern Region is evident when evaluating the composition by LTA. For example, the Yellowstone Highlands (Section M331A) has occurrences of thirty different LTAs. As an interpretation aid, bar charts summarizing the LTA information into landform and geologic material groups by Section are included in each chapter.

In cases where the same LTA occurred in different Subsections of the same Section and had very different accessory characteristics in each location, MUDs were prepared for these LTAs distinguished and characterized by Subsection. In the map unit descriptions which follow, the MUDs that were prepared for single subsections are listed first, and are followed by the MUDs for the rest of that LTA in the Section.

The map unit descriptions for the landtype associations are presented in the following chapters. Preceding the map unit descriptions for each Section is a map showing the location of that Section within the Region, a landscape photograph from that Section, a map showing the distribution of LTAs within that Section and bar charts showing the distribution of major landform groups and geologic material groups. The map unit descriptions have the following format.

LTA symbol: The LTA identifier is hyphenated to include the Section label. Landform name; type of geologic material. If the LTA description is for a single Section, the identifier at the top of the description would follow the format of LTA number then Section Symbol, such as LTA 20-M331A. If one MUD covers two Sections, the identifiers are written as LTA10-M332A, LTA10-M332B.

Location: River drainage, Mountain Ranges, National Forest

Acreage by Section: number of acres of this LTA which occur in each Section (or subsections in some cases) covered by this map unit description.

LTA Setting and General Characteristics

Differentiating Characteristics: Geologic materials and landforms used to

differentiate this unit from the others.

Accessory Characteristics: General soil characteristics, general type of vegetation, mean annual precipitation range, elevation range, dominant slope gradient, stream pattern and density

LTA Components: Identification of major landscape components described in the following paragraphs.

Description of landforms, geologic materials, soil characteristics, slope gradients, soil classification at subgroup level, potential natural vegetation at series level, and percent of the LTA that is occupied by this landscape component.

Compiled by: The name of person who prepared this map unit description and their home unit.

CHAPTER 3

LTA Descriptions

Section 331A Palouse Prairie

This Section occurs in west central Idaho and includes portions of the Columbia River Basalt and Idaho Canyonland geomorphic areas previously described.

LTA Summary: 19 LTAs were mapped in this Section. Nearly half (45%) of the Palouse Prairie that occurs within the Northern Region is dominated by loess covered hills and plateaus (LTA17). Volcanic breaklands (LTA29), metasedimentary mountain slopes and ridges (LTA60), and low hills underlain by Tertiary sediment deposits (LTA83) occupy most of the remaining landscape. River valleys account for less than 2% of the mapped area (LTA's 10 and 12). Map unit descriptions are preceded by the following illustrations:

Figure 5: Map showing location of 331A within the Northern Region

Figure 6: Section 331A Palouse Prairie landscape photograph.
Clearwater National Forest

Figure 7: Map showing distribution of LTAs within 331A

Figure 8: Bar chart showing abundance of landform groups within 331A

Figure 9: Bar chart showing abundance of geologic material groups within 331A

LTA10-331A

VALLEYS: RECENT COARSE ALLUVIUM

Location: This unit is located in the Potlatch and Clearwater River Basins of north-central Idaho.

Acreage by Section

10-331A	11,035

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting, which is typically composed of floodplains, alluvial basins, and stream terraces. Parent materials are recent, coarse alluvial deposits primarily underlain by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep loams or silt loams over gravelly or cobbly sand or loamy sand substrata. The vegetation is a mosaic of deciduous and coniferous forest, riparian shrub communities, and mesic to wet meadows. Mean annual precipitation ranges from 33 to 76 cms. (13 to 30 inches). The elevation range is 244 to 366 meters (800 to 1200 feet). The dominant slopes have gradients of 0 to 10 percent. This unit is moderately dissected by streams, with the dominate stream pattern being dendritic. Wetlands and ponds are a major component of this unit.

LTA Components: This landtype association consists of floodplains, alluvial basins, and stream terraces.

Floodplains and alluvial basins are formed in moderately coarse textured recent alluvium. Slope gradients range from 0 to 3 percent. Soils on these landforms are deep, weakly to moderately developed, and consist mostly of cobbles, gravel, and sands. These soils are classified as Aquic Haploxerolls and Aquic Xerofluvents. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is mesic to wet grass/sedge associations, willow/alder associations, and Ponderosa pine/Douglas-fir series. This component represents 75 percent of this unit.

Stream terraces are formed in mixed, coarse textured alluvium. Slope gradients range from 2 to 10 percent. Soils on these landforms are deep, weakly developed, and consist mostly of medium to moderately fine textures over sand, gravel, and cobble sized rocks. These soils are classified as Fluvaquentic Haploxerolls and Fluventic Eutrochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation series are ponderosa pine, Douglas-fir, and willow/cottonwood associations. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA12-331A

VALLEYS: OUTWASH AND OLDER COARSE ALLUVIUM

Location: This unit is located in the Clearwater River Basin in north central Idaho.

Acreage by Section

12-331A	4,483

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on valley bottoms of canyon breaklands and is dominated by old high terraces. These occur with low flood plains and alluvial fans. Parent materials are mixed alluvium underlain by undifferentiated lithology.

Accessory Characteristics: The primary soils are very deep sands, sandy loams, and loams over cobbles and gravels. The vegetation is a mosaic of grassland and coniferous forest with some unvegetated cobble and sand bars. Mean annual precipitation ranges from 51 to 64 centimeters (20 to 25 inches). The elevation range is 366 to 458 meters (1200 to 1500 feet). The dominant slopes have gradients of 1 to 20 percent. This unit is adjacent to large rivers and may be dissected by smaller streams. In low floodplains and fans, wetlands and cobble and sand bars are numerous.

LTA Components: This landtype association consists of older terraces and floodplains.

Old terraces are formed in old alluvium and loess. Slope gradients range from 1 percent on terrace floors to near vertical on truncated terrace faces. Soils on these landforms are very deep, moderately developed sandyloams and loams with loamy substrata. These soils are classified as Typic Haploxerolls. Rock outcrop is uncommon. The dominant potential natural vegetation series are bluebunch wheatgrass and ponderosa pine. This component represents 65 percent of this unit.

Floodplains are formed in recent alluvium of mixed lithology. Slope gradients range from 1 to 3 percent. Soils on these landforms are deep to very deep, poorly developed stratified sands, gravels, cobbles and some fine material. These soils are classified as cobbly Typic Xerofluvents. Rock outcrop is uncommon. The dominant potential natural vegetation series are bluebunch wheatgrass and ponderosa pine. This component represents 30 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

LTA14-331A

VALLEYS: RECENT FINE ALLUVIUM

Location: This unit is located in the Palouse and Weippe Prairies of north-central Idaho in the Clearwater, Palouse, and Hangman River Basins.

Acreage by Section:

14-331A	20,245

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting, which is typically composed of floodplains, alluvial basins, and stream terraces. Parent materials are recent, fine, alluvial deposits primarily underlain by Columbia flood basalts and Belt metasediments.

Accessory Characteristics: The primary soils are deep to very deep with moderately fine to fine textures. The vegetation is a mosaic of dry to moist coniferous forest, riparian shrub communities, and mesic to wet meadows. Mean annual precipitation ranges from 51 to 102 cms. (20 to 40 inches). The elevation range is 762 to 1067 meters (2500 to 3500 feet). The dominant slopes have gradients of 0 to 10 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a major component of this unit.

LTA Components: This landtype association consists of flood plains, alluvial basins, and stream terraces.

Flood plains and alluvial basins are formed in moderately fine-textured recent alluvium. Slope gradients range from 0 to 3 percent. Soils on these landforms are deep, weakly to moderately developed, and consist mostly of silt loam and silty clay loam textures. These soils are classified as Aquic Haploxerolls and Aquic Xerofluvents. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation are mesic to wet grass/sedge associations, willow/alder associations, and Douglas fir/grand fir series. This component represents 80 percent of this unit.

Stream terraces are formed in mixed alluvium. Slope gradients range from 2 to 10 percent. Soils on these landforms are deep, weakly developed, and consist mostly of medium to moderately fine textures. These soils are classified as Fluvaquentic Haploxerolls and Fluventic Eutrochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation series are ponderosa pine, Douglas -fir, and willow/cottonwood associations. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA17-331A

HILLS AND PLATEAUS: LOESS

Location: This unit is located in west-central Idaho on the Palouse and Camas Prairies.

Acreage by Section:

17-331A	855,787

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and plateaus. Parent materials are a thick layer 2 to 81 meters (6 to 300 feet) thick of wind-blown loess underlain primarily by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay loam subsurface textures. The vegetation is a mosaic of prairie grasslands with forest vegetation at the higher elevations. Mean annual precipitation ranges from 38 to 76 cms. (15 to 30 inches). The elevation range is 305 to 914 meters (1000 to 3000 feet). The dominant slopes have gradients of 0 to 30 percent. This unit is slightly to moderately dissected by streams, with the dominate stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills, and plateaus.

Low relief rolling hills are formed in wind-blown loess exhibiting dune formations, primarily in the Palouse Prairie near Moscow. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam and silty clay loam subsurface textures. These soils are classified as Ultic Argixerolls, Ultic Haploxeralfs, and Pachic Ultic Haploxerolls. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in the prairie grasslands and ponderosa pine, Douglas-fir, and grand fir in forested areas. This component represents 50 percent of this unit.

Plateaus are formed in wind-blown loess overlying volcanic residuum, primarily in the Camas Prairie near Grangeville. Slope gradients range from 0 to 15 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam and silty clay loam subsurface textures. These soils are classified as Ultic Argixerolls, Typic Haploxeralfs, and Ultic Haploxerolls. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in the prairie grasslands and ponderosa pine and Douglas-fir in forested areas. This component represents 50 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA23-331A

BREAKS: SCHISTS AND GNEISSES

Location: This unit is located in the mainstem Clearwater River Valley of Idaho, cutting through the foothills of the Clearwater Mountains near Orofino.

Acreage by Section:

23-331A	6,961

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are moderately weathered gneisses and schists with a variable thickness of wind-blown loess.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very gravelly loams. The vegetation is a mosaic of coniferous forest with numerous rock outcrops and grassy openings. Mean annual precipitation ranges from 64 to 89cms (25 to 35 inches). The elevation range is 305 to 762 meters (1000 to 2500 feet). The dominant slopes have gradients of 60 to 80 percent. This unit is moderately dissected by streams, with the dominate stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks, that sometimes formed along structural breaks.

Stream breaks are formed in colluvial materials from moderately weathered gneisses and schists with a variable layer of loess mixed in the surface layer. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Haploxerolls, Typic Xerochrepts, and Ultic Haploxerolls. Rock outcrop occurs on 20 to 40 percent of this landscape component. The dominant potential natural vegetation series are ponderosa pine, Douglas-fir, and Idaho fescue. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA24-331A

BREAKS: VOLCANICS

Location: This unit is located along the Potlatch and lower Clearwater River Basins of west-central Idaho.

Acreage by Section:

24-331A	210,704

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream breaks. Parent materials are weakly to moderately weathered Columbia flood basalts overlain with a variable thickness of wind-blown loess.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very cobbly loams. The vegetation is a mosaic of grasslands with some shrubland inclusions. Mean annual precipitation ranges from 33 to 64 cms. (13 to 25 inches). The elevation range is 244 to 914 meters (800 to 3000 feet). The dominant slopes have gradients of 60 to 80 percent. This unit is moderately dissected by streams, with the dominate stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks.

Stream breaks are formed in colluvial materials from weakly to moderately weathered Columbia flood basalts with a variable layer of loess mixed in the surface layer. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Haploxerolls, Lithic Argixerolls, and Ultic Argixerolls. Rock outcrop occurs on 20 to 40 percent of this landscape component. The dominant potential natural vegetation series are Idaho fescue, bluebunch wheatgrass, and ponderosa pine in the moister settings. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA59-331A

MOUNTAIN SLOPES AND RIDGES: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in mountains and canyons of north central Idaho and central Idaho in the Clearwater River Basin.

Acreage by Section:

59-331A	2,671

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is colluvial mountain slopes. Parent materials are moderately weathered gneiss, schist and quartzite associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams, loams and sandy loams. The vegetation is dominantly coniferous forest, with some grassland at low elevations on south aspects. Mean annual precipitation ranges from 64 to 114 centimeters (25 to 45 inches). The elevation range is 900 to 1500 meters (3000 to 5000 feet). The dominant slopes have gradients of 35 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in volcanic ash influenced loess, residuum and colluvium of felsic lithology. Soils on these landforms are deep to very deep, moderately developed silt loams, loams and sandy loams with sandy or loamy substrata. Soils on low elevations on south aspects are Ultic Haploxerolls. At mid elevations soils are classified as Andic Dystrochrepts and Typic Dystrochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass, at mid elevations, Douglas-fir and grand fir, and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA60-331A

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Palouse Prairie region and Hangman Creek Basin of north Idaho.

Acreage by Section

60-331A	79,300

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a mixed surface layer of Palouse loess and Mazama volcanic ash underlain by colluvium and residuum of Precambrian Belt rocks such as argillite, quartzite, and siltite.

Accessory Characteristics: The primary soils are moderately deep to deep with silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of prairie and coniferous forest. Mean annual precipitation ranges from 64 to 102 cms (25 to 40 inches). The elevation range is 914 to 1371 meters (3000 to 4500 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a minor component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in Belt colluvium overlain by a mixture of Palouse loess and Mazama volcanic ash. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Ultic Haploxerolls, Typic Argixeralfs, and Andic Xerochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in prairie areas and ponderosa pine, Douglas-fir, and grand fir in forested settings. This component represents 75 percent of this unit.

Ridgetops are formed in Belt residuum and colluvium overlain by a mixed layer of Palouse loess and Mazama volcanic ash in some locations. Slope gradients range from 15 to 40 percent. Soils on these landforms are shallow to deep, moderately developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Typic Haploxerolls, Andic Xerochrepts, and Typic Argixeralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in prairie areas and ponderosa pine, Douglas-fir, and grand fir in forested settings. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA61-331A

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Palouse Prairie region of north Idaho.

Acreage by Section

61-331A	3,275

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a mixed surface layer of Palouse loess and Mazama volcanic ash underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep with silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of prairie and coniferous forest. Mean annual precipitation ranges from 64 to 102 cms. (25 to 40 inches). The elevation range is 914 to 1158 meters (3000 to 3800 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in granitic colluvium overlain by Palouse loess. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Ultic Haploxerolls, Typic Argixeralfs, and Typic Xerochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in prairie areas and ponderosa pine and Douglas-fir in forested settings. This component represents 75 percent of this unit.

Ridgetops are formed in granitic residuum and colluvium overlain by a mixed layer of Palouse loess. Slope gradients range from 15 to 40 percent. Soils on these landforms are shallow to deep, moderately developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Typic Haploxerolls, Typic Xerochrepts, and Typic Argixeralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in prairie areas and ponderosa pine and Douglas-fir in forested settings. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA62-331A

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater Mountains of north central Idaho in the Clearwater River Basin.

Acreage by Section:

62-331A	1,073

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated steep mountain slope landscape setting, below the zone of strong frost shattering, and is typically composed of moderately dissected mountain slopes, ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by weakly weathered granitic and gneissic bedrock.

Accessory Characteristics: The primary soils are deep, moderately coarse textured, and have numerous rock fragments throughout the profile. The vegetation is coniferous forest, with minor native grasslands on low elevation south aspects. Annual precipitation ranges from 64 to 102 centimeters (25 to 40 inches). The elevation range is 750 to 1600 meters (2500 to 5300 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately dissected by streams. Low order streams are parallel and higher order streams are dendritic in pattern. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes and ridge tops.

Mountain slopes are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are moderately deep to deep and well drained. These soils are moderately developed. On south aspects soils have a loam or sandy loam surface layer that overlies very gravelly or very cobbly sandy loam or loamy sand substrata. The dominant soils are classified as Ultic Haploxerolls and Typic Dystrochrepts. On north aspects soils have a thin surface layer of volcanic ash influenced loess. They are Andic Dystrochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and grand fir series and bluebunch wheatgrass. This component represents 80 percent of this unit.

Mountain ridge tops are formed in residuum. Slope gradients range from 20 to 35 percent. Soils on this landform are moderately deep to deep and well drained. Soil textures and degree of soil development are similar to those listed above for south aspects. These soils are Ultic Haploxerolls and Typic Dystrochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation series are Douglas-fir and grand fir. This component represents 15 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

LTA63-331A

MOUNTAIN SLOPES AND RIDGES: SCHIST AND GNEISS

Location: This unit is located in the Clearwater Mountains of Idaho in the Orofino and South Fork Clearwater River Basins.

Acreage by Section

63-331A	7,634

LTA Unit Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a surface layer of Mazama volcanic ash underlain by schist and gneiss with high amounts of mica.

Accessory Characteristics: The primary soils are moderately deep to very deep with silt loam to loam surface textures and gravelly loam subsurface layers. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 102 cms. (25 to 40 inches). The elevation range is 762 to 1068 meters (2500 to 3500 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in schist and gneiss colluvium overlain by Mazama volcanic ash. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 5 per cent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir. This component represents 80 percent of this unit.

Ridgetops are formed in gneiss and schist residuum and colluvium overlain by a mixed layer of Mazama volcanic ash. Slope gradients range from 15 to 50 percent. Soils on these landforms are shallow to deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is western redcedar, grand fir, and Douglas-fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA64-331A

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This unit is located along streams and rivers, and adjacent to basalt plateaus in west central Idaho in the Clearwater River Basin.

Acreage by Section:

64-331A	263,297

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is colluvial mountain slopes and is usually adjacent to steam breaklands or plateaus. Parent materials are poorly to moderately weathered Columbia River basalt.

Accessory Characteristics: The primary soils are moderately deep to deep loams and cobbly loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 30 to 89 centimeters (12 to 35 inches). The elevation range is 275 to 1700 meters (700 to 5800 feet). The dominant slopes have gradients of 35 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in thin or mixed influenced loess, residuum and colluvium of basalt lithology. Slope gradients range from 35 to 50 percent. Soils on these landforms are moderately deep to deep, moderately developed cobbly loams and loams with very cobbly loamy or clayey substrata. These soils are classified as Ultic Argixerolls, with Andeptic Cryoboralfs at higher elevations. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass series, and at mid elevations Douglas-fir and grand fir series.

Compiled by: Pat Green, Nez Perce National Forest

LTA80-331A

LOW RELIEF HILLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Clearwater Mountains of Idaho in the Palouse River Basin.

Acreage by Section

80-331A	11,266

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gentle to moderately sloping, mountain sideslope and ridge landscape setting, which is composed of highly dissected mountain slopes and associated ridges comprised deeply weathered residuum. Parent materials are a mixture of Palouse loess and Mazama volcanic ash overlying moderately to highly weathered quartzites, and siltites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep silt loams and loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 114 centimeters (25 to 45 inches). The elevation range of this unit is 763 to 1220 meters (2500 to 4000 feet). The dominant slopes have gradients of 10 to 30 percent. This unit is highly dissected, but many of the dissections do not have live stream channels. The stream pattern is strongly dendritic.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills with gentle to moderately steep slopes and are formed in metasediments that consist of quartzites, siltites and inclusions of schists overlain by a mixture of Palouse loess and Mazama volcanic ash. The slope gradients range from 10 to 40 percent. Soils on these landforms are deep, moderately to highly weathered and medium textured. The major soils on the well drained sites are classified as Ultic Haploxeralfs, Typic Udivitrands, and Alfic Udivitrands. The dominant potential natural vegetation on the well drained sites are western redcedar and grand fir. This component represents 90 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest and Jerry Niehoff, Idaho Panhandle National Forests

LTA81-331A

LOW RELIEF HILLS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater Mountains of north central Idaho in the Clearwater River Basin.

Acreage by Section:

81-331A	427

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately steep, highly dissected mountain slope landscape setting which is typically composed of dissected slopes, ridge tops, and noses of spur ridges. Parent materials are colluvium and residuum underlain by highly weathered granitic bedrock.

Accessory Characteristics: The primary soils are moderately deep to very deep silt loams and fine sandy loams with sandy substrata. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). The elevation range is 1250 to 1600 meters (4170 to 5300 feet). The dominant slopes have gradients of 10 to 45 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected mountain slopes.

Dissected mountain slopes are formed in residuum and colluvium derived from highly weathered granitics. Slope gradients range from 10 to 45 percent. Soils on this landform are moderately deep to deep and somewhat excessively to well drained. These soils are poorly developed to moderately well developed and consist of silt loam and fine sandy loam volcanic ash influenced loess surface layers that overlie gravelly sandy loam to loamy sand or sand substrata. The dominant soils are classified as Andic Dystrochrepts and Typic Udivitrands. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is grand fir and western redcedar series. This component represents 90 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest.

LTA82-331A

LOW RELIEF HILLS: VOLCANICS

Location: This unit is located in west-central Idaho in the Lower Salmon, Snake, Lolo, and Orofino River Basins.

Acreage by Section:

82-331A	233,530

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are wind-blown loess and Mazama volcanic ash underlain by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep with silt loam and loam surface textures and gravelly silt loam to silty clay subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 51 to 89 cms (20 to 35 inches). The elevation range is 762 to 1372 meters (2500 to 4500 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominate stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in Columbia flood basalt residuum overlain by wind-blown loess and Mazama volcanic ash. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam and loam surface textures and silt loam to gravelly silt loam and silty clay subsurface textures. These soils are classified as Ultic Argixerolls, Ultic Haploxeralfs, and Andic Xerochrepts. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is grand fir, Douglas-fir, and western redcedar in the Lolo and Orofino Creek Basins.

Compiled by: Jim Mital, Clearwater National Forest

LTA83-331A

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This unit is located in west-central Idaho in the Lolo and Orofino Creek Basins.

Acreage by Section:

83-331A	167,138

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are Mazama volcanic ash and wind-blown loess underlain by Tertiary alluvial deposits.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 89 cms. (25 to 35 inches). The elevation range is 762 to 1372 meters (2500 to 4500 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in Tertiary alluvium overlain by Mazama volcanic ash and wind-blown loess. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam to silty clay subsurface textures. These soils are classified as Ultic Haploxeralfs, Typic Eutroboralfs, and Andic Xerochrepts. Rock outcrops are uncommon on this landscape component. The dominant potential natural vegetation is grand fir, Douglas-fir, and western redcedar.

Compiled by: Jim Mital, Clearwater National Forest

LTA84-331A

LOW RELIEF HILLS: HIGHLY WEATHERED SCHISTS

Location: This unit is located at middle elevations in north central Idaho in the Clearwater River basin.

Acreage by Section:

84-331A 24,608

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is rolling uplands developed in volcanic ash influenced loess and highly weathered residuum of Precambrian schist.

Accessory Characteristics: The primary soils are very deep silt loams. The vegetation is dominantly coniferous forest. Mean annual precipitation ranges from 97 to 127 centimeters (38 to 45 inches). The elevation range is 1250 to 1600 meters (4167 to 5000 feet). The dominant slopes have gradients of 20 to 50 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists of rolling hills.

Rolling hills are formed in volcanic ash influenced loess and schist residuum. Soils on these landforms are very deep, moderately developed silt loams with gravelly sandy loam substrata. These soils are classified as Typic Udivitrands. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation is western red cedar and grand fir, with Sitka alder communities in moist openings.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

LTA90-331A

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in west-central Idaho in the South Fork Clearwater River Basin.

Acreage by Section:

90-331A	2,621

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is mass wasted slopes. Parent materials can be of any lithology, but in this Section they are dominantly volcanics (Columbia flood basalts) overlain with a variable thickness of Mazama volcanic ash.

Accessory Characteristics: The primary soils are deep to very deep siltloams to cobbly loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 51 to 89 cms (20 to 35 inches). The elevation range is 610 to 1219 meters (2000 to 4000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel to dendritic. Wetlands are a minor component of this unit, but moist seeps can be locally common.

LTA Components: This landtype association consists of mass wasted slopes.

Mass wasted slopes are formed in mixed Mazama volcanic ash overlying Columbia flood basalts. Slope gradients range from 30 to 60 percent. Soils on these landforms are deep to very deep, weakly to moderately developed loams to cobbly loams, sometimes with a clayey substrata. These soils are classified as Typic Dystrocrepts, Ultic Argixerolls, and Andic Xerochrepts. Rock outcrops occurs on less than 10 percent of this unit. The dominant potential natural vegetation is ponderosa pine, Douglas-fir, and grand fir.

Compiled by: Jim Mital, Clearwater National Forest

CHAPTER 4

LTA Descriptions

Section M331A Yellowstone Highlands

This Section occurs in south-central Montana and northwest Wyoming. It generally coincides with the Yellowstone Volcanic Plateau geomorphic area previously described. Nineteen LTAs were mapped in this Section. See Appendix F for a complete list of the LTAs and their acreages. The map unit descriptions are preceded by the following illustrations.

Figure 10: Map showing location of M331A within the Northern Region

Figure 11: Section M331A landscape photograph.
Northern Yellowstone National Park

Figure 12: Map showing distribution of LTAS within M331A

Figure 13: Bar chart showing abundance of landform groups within M331A

Figure 14: Bar chart showing abundance of geologic groups within M331A

**LTA10-M331Am
LTA10-M331Ap
LTA10-M332E**

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the Beaverhead, Anaconda Pintlar, Fleece, Pioneer, Lima, Tendoy, and Madison Ranges. These are in southwest Montana in the Jefferson and Madison Basins.

Acreage by Subsection/Section

10-M331Am	5,925
10-M331Ap	6,935
10-M332E	88,247 (all of Section except M332En)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley bottom and alluvial fan landscape setting, which is typically composed of glacial outwash plains, stream terraces, and alluvial fans. Parent materials are undifferentiated deposits of silts, sands, gravels, and cobble, which can be underlain by any bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep, gravelly loamy sands. The vegetation is a mosaic of deciduous shrubs, deciduous forest, coniferous forest, upland grasslands, and wet meadow. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 1951 to 2804 meters (6400 to 9200 feet). The dominant slope gradients are 0 to 15 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of glacial outwash plains, stream terraces, and alluvial fans.

Glacial outwash fans are formed in relatively coarse alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are shallow to moderately deep, poorly developed, well to excessively drained gravelly loamy sands and sandy loams. Predominant soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than one percent of this landscape component. The dominant potential natural vegetation is mountain big sagebrush and Idaho fescue series. This component represents sixty percent of this land type association.

Stream terraces are formed in mixed alluvium and reworked glacial outwash. Slope gradients range from 0 to 5 percent. Soils on these landforms are shallow to moderately deep, poorly developed, well-drained gravelly loams and sandy loams. Predominant soils are classified as Typic Cryorthents, and Typic Cryochrepts. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is Douglas-fir and mountain big sage series. This component represents 20 percent of this land type association.

Alluvial fans are formed in alluvium. Slope gradients range from 5 to 15 percent. Soils on these landforms are shallow, poorly developed, well drained gravelly sandy loams. Predominant soils are classified as Typic Cryochrepts, and Typic Cryoborolls. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is mountain big sage. This component represents 20 percent of this LTA.

LTA10-M331A

VALLEYS: RECENT COARSE ALLUVIUM

Location: This unit is located in valley bottoms throughout the Gallatin Forest and the Beartooth Mountains in the Custer National Forest in southwestern Montana.

Acreage by Section:

10-M331A 31,149 (Section except M331Am and M331Ap)

LTA Setting and General Characteristics:

Differentiating Characteristics: This map unit consists of glacial outwash and stream terraces, flood plains, alluvial fans, and bars in valley bottoms. Parent material is relatively coarse textured stream alluvium.

Accessory Characteristics: Vegetation is sparse to dense Douglas-fir forest, lower subalpine forest, grassland, meadow, and hardwood riparian communities. Elevation ranges from 1525 to 2438 meters (5000 to 8000 feet). Mean annual precipitation is 50 to 102 centimeters (20 to 40 inches). Slopes range from 0 to 10 percent.

LTA Components: This landtype association consists of two components:

Where vegetation is Douglas-fir forest, grassland, and hardwood riparian communities, soils are Cryoborolls, Cryofluvents, and Cryaquolls. These soils are moderately coarse textured, rocky, and have moderate fertility and water holding capacity. Common potential vegetation includes Idaho fescue, big sagebrush and Douglas-fir series along with various aspen, willow, and grass communities in wet areas. This component makes up 70 percent of this LTA.

Where vegetation is lower subalpine forest, meadows, and hardwood riparian communities, soils are Cryoborolls and Cryoboralfs. These soils are moderately coarse to medium textured, rocky, and have moderate to high fertility and water holding capacity. Common potential vegetation is subalpine fir and spruce. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest.

LTA12-M331A
LTA12-M332Db
LTA12-M332Dk

**VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIAL
DEPOSITS**

Location: This unit is located mostly in the Beartooth, southern Gallatin, and Madison mountain ranges in southwestern Montana with smaller amounts in the Bridger and Crazy Mountains.

Acreage by Section:

12-M331A	59,997
12-M332Db	8,115
12-M332Dk	41,445

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently sloping glacial outwash plains, alluvial fans, and terraces, with some landflows. Parent material is coarse textured glaciofluvial deposits with some mixed loess (wind blown silt) in the soils' surface layer.

Accessory Characteristics: Vegetation is dense lodgepole pine forest, scattered Douglas-fir forest, or mountain grassland. Elevation ranges from 1560 to 2438 meters (5200 to 8000 feet). Mean annual precipitation is 38 to 81 centimeters (15 to 32 inches). Slope ranges from 0 to 40 percent.

LTA Components: This landtype association consists of two components:

Where vegetation is grassland, soils are Typic and Aridic Argiborolls with some carbonatic soils such as Typic Cryoborolls, Calcic Cryoborolls, and Ustollic Haplargids. These soils are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Common potential vegetation is big sagebrush and Idaho fescue series. This component makes up 40 percent of the LTA.

Where vegetation is lodgepole pine forest or Douglas-fir forest, soils are Typic Cryochrepts or Typic Cryoboralfs. These soils are moderately coarse to medium textured, rocky, and have very low to moderate fertility and water holding capacity. A common potential vegetation is lodgepole pine near Hebgen Lake in the Gallatin Range. This component makes up 60 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

LTA14-M331A
LTA14-M332E

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located in the Beaverhead, Anaconda-Pintlar, Flecser, Pioneer, Lima, Tendoy, Gravelly, and Madison Ranges in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

14-M331A	12,271
14-M332E	94,932

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in the larger valley bottoms, which is typically composed of floodplains, glacio-fluvial wetlands, and outwash alluvium. Parent materials are recent alluvium and glacio-fluvial outwash deposits.

Accessory Characteristics: The primary soils are deep with fine textures and organics. The vegetation is a mosaic of riparian deciduous and coniferous forest, riparian shrub meadows and sedge meadows. Mean annual precipitation ranges from 50 to 102 centimeters (20 to 40 inches). The elevation range of this LTA is 2073 to 2896 meters (6800 to 9500 feet). The dominant slopes have gradients of 0 to 10 percent.

This LTA is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of floodplains, glaciofluvial wetlands, and outwash alluvium.

The floodplains are formed in variable alluvium, typically finer and/or organic nearer the surface. Slope gradients range from less than one to four percent. Soils on these landforms are typically deep weakly to moderately developed, poorly drained sands to silt, often with organic surface soils. These soils are classified as Histic Cryaquolls and Aquic Cryoborolls. Rock outcrop does not occur. The potential natural vegetation is a variety of riparian/wetland communities such as willows and sedges. This component represents about 50 percent of this LTA.

Alluvial wetlands are formed in relatively fine glacial outwash and sediments, in glaciofluvial valley fill deposits. Slope gradients range from 1 to 10 percent. Soils on these landforms are deep, poorly drained, weakly to moderately developed, silt loams and silty clay loams, often with organic surface soils. These soils are classified as Histic Cryaquolls and Aquic Cumulic Cryoborolls. Rock out crop does not occur in these wetlands, but do occur in the intermingled uplands. The dominant potential natural vegetation is tufted hairgrass. This component represents about 30 percent of this LTA.

Outwash alluvium is formed in glacial outwash and mixed alluvium and glacial outwash. Slope gradients range from 1 to 15 percent. Soils on these landforms are deep organic soils and deep, poorly drained silt loams and sandy loams. These soils are classified as Sapric Terric Medihemists and Oxyaquic Cryoborolls. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is comprised of various willow and wet meadow communities such as willows and sedges. This component represents about 20 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-DeerLodge National Forest

LTA23-M331A
LTA23-M332E

BREAKS: SCHISTS AND GNEISSES

Location: This LTA is located in the Lima Peaks, Tendoy, Tobacco Root, Gravelly, and Madison mountain ranges of the Beaverhead National Forest. It occurs in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

23-M331A	25,231
23-M332E	23,278

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings which is typically composed of structural and streambreaklands. Parent materials are colluvium and residuum derived from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diabase, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite and migmatite, including the Dillon Granite-Gneiss in the Tendoy Mountains.

Accessory Characteristics: The primary soils are very shallow to moderately deep, well drained, channery sandy loams and loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 3048 meters (6600 to 10000 feet). The dominant slopes have gradients of 40 to 75 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic to parallel. Wetlands, lakes, and ponds are not a component of this LTA.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 40 to 75 percent. Soils on these landforms are very shallow to moderately deep, well-drained, weakly developed channery sandy loams to loams. These soils are classified as Lithic and Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 25 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, big sagebrush, subalpine fir and whitebark pine series. This component represents 100 percent of LTA.

Compiled by: Dan Svoboda, Beaverhead/Deerlodge National Forest

LTA25-M331A
LTA25-M332D

BREAKS: SANDSTONES AND SHALES

Location: This unit is located in the Beartooth, Bridger, Crazy, Gallatin and Madison mountain ranges in southwestern Montana.

Acreage by Section:

25-M331A	69,798
25-M332D	20,570

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep to moderately steep ridges and slopes whose shape is controlled by underlying bedrock structure. Soil parent material is colluvium and residuum derived from thickly interbedded limestone, sandstone, and shale.

Accessory Characteristics: Vegetation is sparse to dense forest with some meadows and grassland. Elevation ranges from 1830 to 2640 meters (6000 to 8800 feet). Mean annual precipitation is 58 to 127 cms. (23 to 50 inches). Slopes are greater than 40 percent.

LTA Components: This landtype association consists of two components:

Where vegetation is sparse Douglas-fir forest and grasslands, soils are Argic Cryoborolls and Mollic Cryoboralfs. These soils are medium to moderately fine textured, rocky or non-rocky, with moderate to high fertility and water holding capacity. Where bedrock is limestone, soils are Lithic and Typic Calciborolls, and Calcic Cryoborolls. Rock outcrop makes up 10 to 25 percent of this component. Common potential vegetation includes Douglas-fir, Idaho fescue, and big sagebrush series. This component makes up 50 percent of this LTA.

Where vegetation is dense forest and meadows, soils are Mollic and Typic Cryoboralfs, Typic Cryochrepts, and Argic Cryoborolls. These soils are medium to moderately fine textured, rocky or non-rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up 10 to 25 percent of this component. Common potential vegetation includes Douglas-fir, subalpine fir, Idaho fescue and subalpine fir-whitebark pine series. This component makes up 50 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

LTA27-M331A
LTA27-M332E

BREAKS: CARBONATES

Location: This LTA is located in the Lima Peaks, Tendoy, Pioneer, Fleecer, Tobacco Root, Gravelly, and Madison mountain ranges in the Beaverhead National Forest. It occurs in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

27-M331A	6,506
27-M332E	62,706

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, deeply eroded (rejuvenated), or faulted mountainous landscape setting which is typically composed of structural and stream breaklands. Parent materials are colluvium and residuum derived largely from volcanics and limestone rocks of various ages.

Accessory Characteristics: The primary soils are shallow to moderately deep, well-drained channery loams. The vegetation is a mosaic of mountain grasslands and open coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is (2012 to 2591 meters (6600 to 8500 feet). The dominant slopes have gradients of 55 to 75 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being dendritic to parallel. Wetlands and seeps are a minor component of this LTA.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 45 to 85 percent. Soils on these landforms are shallow, well drained, weakly developed, channery loams. These soils are classified as Lithic and Typic Cryochrepts. Rock outcrop occurs on about one third of this landscape component. The dominant potential natural vegetation is low sagebrush, curlleaf mountain mahogany, and Douglas-fir series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead/DeerLodge National Forest

LTA34-M331A

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This unit is located in the Gallatin and Madison mountain ranges in southwestern Montana.

Acreage by Section:

34-M331A	93,405

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep mountain slopes and ridges. Soil parent material is colluvium and residuum derived from andesitic volcanic rocks.

Accessory Characteristics: Vegetation is dense to sparse lower subalpine forest, Douglas-fir forest, or mountain grassland. Elevation ranges from 1981 to 2591 meters (6500 to 8500 feet). Mean annual precipitation is 75 to 100 centimeters (30 to 40 inches). Slopes range from 30 to 60 percent.

LTA Components: This landtype association consists of two components.

Soils in sparse to dense lower subalpine forest with some Douglas-fir forest are Mollic Cryoboralfs. They are deep to moderately shallow, medium to moderately fine textured, rocky, and have moderate to high fertility and water holding capacity. Rock outcrop makes up 10 to 40 percent of this component. Common potential vegetation includes subalpine fir and Douglas-fir series. This component makes up 60 percent of this LTA.

Soils in sparse to dense Douglas-fir forest and grasslands are Pachic Argiborolls, Mollic Eutroboralfs, and Typic Argiborolls. They are deep, moderately coarse to moderately fine textured, rocky, and have moderate to high fertility and water holding capacity. Rock outcrop makes up 15 percent of this component. Common potential vegetation includes Douglas-fir, big sagebrush, and Idaho fescue series. This component makes up 40 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA36-M331A

HIGH RELIEF MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This unit is located in the Beartooth, Gallatin, Bridger, and Madison mountain ranges in southwestern Montana.

Acreage by Section:

36-M331A	75,189

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep mountain slopes and ridges. Soil parent material is colluvium and residuum derived from relatively soft interbedded sandstone and shale and lahars of the Livingston Group.

Accessory Characteristics: Vegetation is dense to sparse lower subalpine forest, Douglas-fir forest, or mountain grassland. Elevation ranges from 1676 to 2438 meters (5500 to 8000 feet). Mean annual precipitation is 53 to 69 cm. (21 to 27 inches). Slopes range from 20 to 90 percent.

LTA Components: This landtype association has two components:

Soils in sparse to dense lower subalpine forest are Cryoboralfs and Cryochrepts. They are deep to moderately shallow, moderately coarse to moderately fine textured, rocky, and have low to moderate fertility and water holding capacity. Rock outcrop makes up 15 percent of this component. A common potential vegetation is the subalpine fir series. This component makes up 70 percent of this LTA.

Soils in sparse to dense Douglas-fir forest and grasslands are Lithic Haploborolls, Typic Ustochrepts, and Typic Argiborolls. They are deep, moderately coarse to moderately fine textured, rocky or non-rocky, and have low to moderate fertility and water holding capacity. Rock outcrop makes up 15 percent of this component. Common potential vegetation includes Douglas-fir and Idaho fescue series. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

LTA37-M331A

HIGH RELIEF MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located in the Beartooth Mountains of southwest Montana.

Acreage by Section:

37-M331A 33,733

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a mountain landscape setting dissected by streams, which is typically composed of mountain slopes and dipslopes. Parent materials are gravelly and cobbly residuum and colluvium underlain by limestone and some sandstone and shale.

Accessory Characteristics: The primary soils are shallow to deep, with cobbly and channery medium and moderately coarse textures. The vegetation is a mosaic of coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 58 to 89 cms (23 to 35 inches). The elevation range is 1830 to 2500 meters (6000 to 8200 feet). The dominant slopes have gradients of 40 to 90 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain slopes and dipslopes.

Mountain slopes are formed in colluvial and residual limestone material. Slope gradients range from 20 to 90 percent. Soils on these landforms are shallow to deep, weakly developed, channery medium textures. These soils are classified as Lithic Calciborolls, Typic Calciborolls, and Calcic Cryoborolls. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and Douglas-fir series. This component represents 60 percent of this unit.

Dipslopes are formed in colluvial and residual limestone material. Slope gradients range from 20 to 90 percent. Soils on these landforms are shallow to deep, moderately developed, medium and moderately fine textured. These soils are classified as Calcic Cryoborolls, Lithic Calciborolls, and Argic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is limber pine, subalpine fir and Douglas-fir series. This component represents 40 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA39-M331A

STEEP GLACIATED MOUNTAIN SLOPES: GNEISSES AND SCHISTS

Location: This LTA is located in the Beartooth Mountains of southwest Montana.

Acreage by Section:

39-M331A	150,081

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a glaciated mountain landscape setting, which is typically composed of cirques, and troughs. Parent materials are gravelly and cobbly residuum and colluvium underlain by gneiss and schist bedrock.

Accessory Characteristics: The primary soils are shallow to deep, with medium and coarse textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 53 to 140 cms. (21 to 55 inches). The elevation range is 1675 to 3200 meters (5500 to 10500 feet). The dominant slopes have gradients of 40 to greater than 90 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of cirques and troughs.

Cirques are formed in colluvial and residual gneiss and schist material. Slope gradients range from 70 to greater than 100 percent. Soils on these landforms are shallow to deep, weakly developed, coarse textured. These soils are classified as Typic Cryorthents, Lithic Cryorthents, and Typic Cryochrepts. Rock outcrop occurs on about 60 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and Douglas-fir series. Tree canopies are often stunted and deformed, existing as Krummholz pattern above 8800 feet. This component represents 50 percent of this unit.

Troughs are formed in colluvial and residual gneiss and schist material. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to deep, weakly developed, medium and coarse textured. These soils are classified as Typic Cryorthents, Lithic Cryorthents, and Lithic Cryochrepts. Rock outcrop occurs on about 50 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, limber pine and subalpine fir. Tree canopies are often stunted and deformed, existing as Krummholz pattern above 8800 feet. This component represents 50 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA40-M331A
LTA40-M332E

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This LTA is located in the Lima Peaks, Pioneers, Beaverhead, and Madison mountain ranges in the Beaverhead National Forest in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

40-M331A	626
40-M332E	100,569

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, glacial landscape setting which is typically composed of glacial headwalls and troughwalls. Narrow, V-shaped trough valley bottoms and cirque basins are described under LTA 50. Parent materials are metamorphosed sediments of the Precambrian Y Belt Supergroup undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are shallow, flaggy, cobbly, or gravelly loamy sands and sandy loams. The vegetation is a mosaic of coniferous forest, alpine turf, and rockland. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2256 to 3231 meters (7400 to 10600 feet). The dominant slopes have gradients of 50 to 70 percent. This LTA is highly to moderately dissected with the dominant pattern being parallel. Wetlands/seeps are a minor component of this LTA.

LTA Components: This landtype association consists of cirque headwalls and troughwalls.

Headwalls are formed in metasediment bedrock. They usually have well developed avalanche chutes and rock glaciers/scree. Slope gradients range from 50 to 90 percent. Soils on these landforms are very shallow, weakly developed, flaggy loamy sands and loams. These soils are classified as Lithic and Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 75 percent of this landscape component. The dominant potential natural vegetation is whitebark pine, and whitebark pine-subalpine fir series. This landform component represents about 15 percent of this LTA.

Troughwalls are formed in metasediment bedrock. They have thin to thick till deposits, and often have developed avalanche chutes. Slope gradients range from 45 to 70 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, gravelly and cobbly loamy sands, sandy loams, and loams. These soils are classified as Lithic and Typic Cryochrepts, and Entic and Typic Cryumbrepts. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, and subalpine fir series. This landform component represents about 85 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forests

LTA41-M331A
LTA41-M332Dc

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Gallatin and Crazy mountain ranges in southwestern Montana.

Acreage by Section:

41-M331A	117,326
41-M332Dc	72,095

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep glacial troughwalls with weak stream dissection. Included are some talus slopes and rock glaciers. Soil parent material is colluvium and glacial till derived from shallow, coarse grained, hard intrusive rocks.

Accessory Characteristics: Vegetation is sparse to dense upper subalpine, lower subalpine, or Douglas-fir forest. Elevation ranges from 1768 to 2743 meters (5800 to 9000 feet). Mean annual precipitation is 63 to greater than 125 centimeters (25 to greater than 50 inches). Slopes are greater than 40 percent.

LTA Components: This landtype association has two components:

Soils where vegetation is either Douglas-fir or lower subalpine forest are Udic Ustochrepts or Dystric Cryochrepts. These soils are deep, moderately coarse to coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 to 30 percent of this component. Common potential vegetation includes subalpine fir and Douglas-fir series. This component makes up 35 percent of this LTA.

Soils where vegetation is sparse upper subalpine forest or nearly absent are Cryochrepts. They are deep to shallow, and generally coarse textured with very low fertility and water holding capacity. Rock outcrop makes up 50 to 90 percent of this component. Where forested, a common potential vegetation is subalpine fir-whitebark pine series. This component makes up 65 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA42-M331A

STEEP GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This unit is located in the Gallatin and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:
42-M331A 60,666

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep glacial troughwalls with weak stream dissection. Soil parent material is colluvium and glacial till derived from andesitic volcanic rocks.

Accessory Characteristics: Vegetation is sparse to dense lower subalpine or Douglas-fir forest intermixed with meadows. Elevation ranges from 2316 to 2591 meters (7600 to 8500 feet). Mean annual precipitation is 75 to greater than 125 centimeters (30 to greater than 50 inches). Slopes are greater than 40 percent.

LTA Components: This landtype association has one component:

Soils are Typic Cryochrepts. These soils are deep, moderately coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 25 percent of this component. Common potential vegetation includes subalpine fir and Douglas-fir series.

Compiled by: Henry Shovic, Gallatin National Forest

LTA43-M331A

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This unit is located in the Bridger, Gallatin and Madison mountain ranges in southwestern Montana.

Acreage by Section:
43-M331A 42,458

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep glacial troughwalls and hogback ridges with weak stream dissection. Soil parent material is colluvium and glacial till derived from limestone with some interbedded sandstone and shale.

Accessory Characteristics: Vegetation is sparse to dense forest with some meadows and grassland. Elevation ranges from 1768 to 2682 meters (5800 to 8800 feet). Mean annual precipitation is 75 to 125 centimeters (30 to 50 inches). Slope is greater than 40 percent.

LTA Components: This landtype association has one component:

Soils are Typic Argiborolls, Typic Calciborolls, Typic Cryochrepts, Typic Cryoboralfs, and other Cryochrepts and Cryoborolls. These soils are medium to moderately coarse textured, rocky, and have medium to low fertility and water holding capacity. Rock outcrop makes up 15 to 60 percent of this component. Common potential vegetation includes Idaho fescue, big sagebrush, subalpine fir, and subalpine fir-whitebark pine series.

Compiled by: Henry Shovic, Gallatin National Forest

LTA44-M331A

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONE AND SHALE

Location: This unit is located in the Gallatin and Madison mountain ranges in southwestern Montana.

Acreage by Section:

44-M331A	17,976

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep glacial troughwalls with weak stream dissection. Soil parent material is colluvium and glacial till derived from interbedded sandstone and shale.

Accessory Characteristics: Vegetation is dense lower subalpine forest intermixed with meadows. Elevation ranges from 2316 to 2591 meters (7600 to 8500 feet). Mean annual precipitation is 75 to greater than 125 centimeters (30 to greater than 50 inches). Slopes are greater than 40 percent.

LTA Components: This landtype association has one component:

Soils are Typic Cryoboralfs and Typic Cryochrepts. These soils are moderately fine to moderately coarse textured, rocky or non-rocky, and have medium to low fertility and water holding capacity. Rock outcrop makes up 20 percent of this component. Common potential vegetation includes subalpine fir and Idaho fescue series.

Compiled by: Henry Shovic, Gallatin National Forest

LTA51-M331A
LTA51-M332D
LTA51-M332E

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Gallatin, Madison, Crazy, and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:

51-M331A	760
51-M332D	98,809
51-M332E	125,884

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently to moderately steep glacial moraine. Soil parent material is glacial till derived from coarse grained, shallow, hard intrusive rocks.

Accessory Characteristics: Vegetation is sparse to dense upper to lower subalpine forest, Douglas-fir forest, or mountain grassland. Elevation ranges from 1981 to 2743 meters (6500 to 9000 feet). Mean annual precipitation is 50 to greater than 125 centimeters (20 to greater than 50 inches). Slopes range from 0 to 40 percent.

LTA Components: This landtype association has three components:

Where vegetation is grassland, soils are Typic Cryoborolls and Argic Cryoborolls. These soils are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. Common potential vegetation includes big sagebrush and Douglas-fir. This component makes up 15 percent of the LTA.

Where vegetation is lower subalpine forest with some Douglas-fir forest, soils are Typic Cryochrepts. These soils are moderately coarse texture, rock, and have low fertility and water holding capacity. Rock outcrop makes up 10 percent of this component. Common potential vegetation includes subalpine fir with some Douglas-fir. This component makes up 50 percent of the LTA.

Where vegetation is upper subalpine forest, soils are Cryochrepts intermixed with some Cryumbrepts. These soils are deep to moderately shallow, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 to 40 percent of this component. Common potential vegetation includes subalpine fir-whitebark pine, and Idaho fescue series. This component makes up 35 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA53-M331A

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This unit is located in the Madison and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:

53-M331A 76,853

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently to moderately steep glacial moraine. Soil parent material is glacial till derived from interbedded sandstone and shale.

Accessory Characteristics: Vegetation is sparse to dense upper to lower subalpine forest or mountain grassland. Elevations range from 2134 to 2591 meters (7000 to 8500 feet). Mean annual precipitation is 75 to 100 centimeters (30 to 40 inches). Slopes range from 0 to 40 percent.

LTA Components: This landtype association has two components:

Where vegetation is grassland, soils are Argic Cryoborolls. These soils are deep, medium to moderately fine textured, rocky, and have moderate to high fertility and water holding capacity. Rock outcrop makes up zero to five percent of this component. Common potential vegetation includes big sagebrush and Idaho fescue series. This component makes up 40 percent of the LTA.

Where vegetation is upper or lower subalpine forest, soils are Typic and Mollic Cryoboralfs. These soils are medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up zero to five percent of this component. Common potential vegetation includes subalpine fir, and subalpine fir-whitebark pine series. This component makes up 60 percent of the LTA. This component makes up 60 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA54-M331A

GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This unit is located in the Gallatin and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:

54-M331A	87,011

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently to moderately steep glacial moraine. Soil parent material is glacial till derived from andesitic or rhyolitic volcanic rocks.

Accessory Characteristics: Vegetation is sparse to dense upper subalpine or lower subalpine forest. Elevation ranges from 2195 to 2743 meters (7200 to 9000 feet). Mean annual precipitation is 75 to greater than 125 centimeters (30 to greater than 50 inches). Slopes range from 0 to 40 percent.

LTA Components: This landtype association has two components:

Where glacial till is derived from andesitic rock types, soils are Mollic Cryoboralfs. These soils are deep, medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up from 10 to 25 percent of this component. Common potential vegetation includes subalpine fir, subalpine fir-whitebark pine, and Idaho fescue series. This component makes up 40 percent of the LTA.

Where glacial till is derived from rhyolitic rock types, soils are Typic Cryochrepts. There is a thin layer of loess (wind blown silt) mixed in with the surface layer of these soils. These soils are deep, moderately coarse textured, rocky, and have low to moderate fertility and water holding capacity. Rock outcrop makes up from 0 to 5 percent of this component. A common potential vegetation series is subalpine fir. This component makes up 60 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA57-M331A
LTA57-M332D

GLACIATED MOUNTAIN SLOPES: GNEISSES AND SCHISTS

Location: This LTA is located mostly in the Beartooth Mountains of southwest Montana. A very small acreage occurs in the Bridger Range.

Acreage by Section:

57-M331A	177,582
57-M332D	569

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a glaciated mountain landscape setting, which is typically composed of moraines. Parent materials are very bouldery glacial till underlain by weakly metamorphosed gneiss and schist bedrock. In the Bridger Range this unit consists mostly of weakly metamorphosed granite.

Accessory Characteristics: The primary soils are deep, with very bouldery medium to moderately coarse textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 55 to 114 cms. (22 to 50 inches). The elevation range is 1675 to 2743 meters (5500 to 9000 feet). The dominant slopes have gradients of 0 to 80 percent.

LTA Components: This landtype association consists of ground moraines in grassland, ground moraine in forest, and lateral moraines.

Ground moraines are formed in glacial till developed from gneiss and schist material. Slope gradients range from 5 to 20 percent. Forested soils on these landforms are shallow to deep, weakly developed, and very bouldery medium to moderately coarse textured. These soils are classified as Typic Cryumbrepts, Typic Cryochrepts, Typic Cryofluvents, and Lithic Cryorthents. The dominant potential natural vegetation is Douglas-fir, limber pine and subalpine fir. This component represents 70 percent of this unit.

Ground moraines in grassland are formed in glacial till developed from gneiss and schist with some probable addition of loess. Soils are Typic Cryoborolls, and Argic Cryoborolls. They are moderately coarse to medium textured, deep, and moderately fertile. The dominant potential natural vegetation is Idaho fescue and bluebunch wheatgrass. Rock outcrop makes up 5 percent of the unit. This component represents 15 percent of this unit.

Lateral moraines are formed in glacial till developed from gneiss and schist material. Slope gradients range from 50 to 80 percent. Soils on these landforms are shallow to deep, moderately developed, medium and moderately fine textured. These soils are classified as Typic Cryoborolls, Typic Cryochrepts, and Typic Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This component represents 15 percent of this unit.

Compiled by: John R. Lane, Custer National Forest and Henry Shovic, Gallatin National Forest

LTA62-M331A

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Gallatin, Madison, and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:

62-M331A	15,110

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of a complex of mountain slopes and ridges. Soil parent material is colluvium and residuum derived from hard crystalline rocks such as granite.

Accessory Characteristics: Vegetation is dense lower subalpine forest or mountain grassland. Elevation ranges from 1981 to 1987 meters (6500 to 9800 feet). Mean annual precipitation is 50 to greater than 125 centimeters (20 to greater than 50 inches). Slopes range from 0 to 20 percent.

LTA Components: This landtype association has two components:

Soils in mountain grasslands are Typic and Argic Cryoborolls. They are deep, medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up 15 percent of this component. Common potential vegetation includes Idaho fescue and big sagebrush series. This component makes up 50 percent of this LTA.

Soils in forest are Typic Cryochrepts. They are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. Common potential vegetation includes the subalpine fir series. This component makes up 50 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA63-M331Ah

MOUNTAIN SLOPES AND RIDGES: GNEISSES AND SCHISTS

Location: This LTA is located in the Beartooth Mountains of southwest Montana.

Acreage by Section:

63-M331Ah 20,784

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a dissected mountain landscape setting, which is typically composed of mountain slopes. Parent materials are residuum underlain by gneiss and schist bedrock.

Accessory Characteristics: The primary soils are shallow to deep, with moderately fine to coarse textures. The vegetation is a mosaic of coniferous forest and mountain grassland. Mean annual precipitation ranges from 55 to 114 cms. (22 to 45 inches). The elevation range is 1981 to 2743 meters (6500 to 9000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in residual gneiss and schist material. Slope gradients range from 30 to 60 percent. Soils on these landforms are shallow to deep, weakly developed, moderately fine to coarse textured. These soils are classified as Typic Cryorthents, Typic Cryochrepts, and Typic Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA63-M331A
LTA63-M332E

MOUNTAIN SLOPES AND RIDGES: GNEISSES AND SCHISTS

Location: This LTA is located in the Tendoy, Gravellys, Tobacco Roots and Madison Ranges in southwest Montana. Major drainages are the Red Rock, Beaverhead, Ruby and Madison Rivers in the Jefferson Basin and Madison Basins.

Acreage by Section:

63-M331A	158,933 (Section except M331Ah)
63-M332E	110,855

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting, below the elevational zone of strong and moderate frost shattering. This unit is typically composed of dissected slopes with ridges and narrow, mostly ephemeral, bottoms. Parent materials are colluvium and residuum derived from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diabase, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite, and migmatite, including the Dillon Granite-Gneiss in the Tendoy Mountains.

Accessory Characteristics: The primary soils are moderately deep, well drained, dark colored, channery loams and fine sandy loams. The vegetation is a mosaic of coniferous forest and mountain grassland. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 2042 to 2652 meters (6700 to 8700 feet). The dominant slopes have gradients of 25 to 50 percent.

This LTA is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of slopes with rounded ridges and narrow, steep, mostly ephemeral valley bottoms.

Mountain slopes and ridges are formed in colluvium and residuum. Slope gradients range from 25 to 50 percent. Soils on these landforms are moderately deep, weakly to moderately developed, channery loams and fine sandy loams. These soils are classified as Typic Cryochrepts and Typic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir, and subalpine fir series. This landscape component represents about 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead/Deerlodge National Forest

**LTA64-M331A
LTA64-M332E
LTA64-M332D**

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located in the Boulder, Elkhorn, Fleecer, Anaconda, Pintlar, Beaverhead, Madison, Pioneer, Lima Peaks, Gravelly, Tendoy, and Gallatin Mountains on the Beaverhead-Deerlodge, Helena, and Gallatin National Forests. These occur in southwest Montana in the upper Missouri River Basin and the upper Little Blackfoot drainage.

Acreage by Section:

64-M331A	21,460
64-M332E	215,232
64-M332D	197,349

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes and mountain ridges. Parent materials are residuum underlain by Tertiary and Cretaceous volcanic bedrock, including andesite, dacite, rhyolite, welded and non-welded rhyolite and felsic tuffs, and locally basalt and minor metagabbro dikes.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep loamy soils often with high cobble contents. The vegetation is a mosaic of coniferous forest and shrubland/grassland, coniferous forest or shrubland/grassland. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1525 to 2378 meters (5000 to 7800 feet). The dominant slopes have gradients of 5 to 60 percent.

The mountain slopes component of this LTA is moderately dissected by streams with the dominant stream patterns being parallel or dendritic. The mountain ridges are generally undissected. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes, and mountain ridges.

Stream dissected mountain slopes are formed in colluvium and residuum over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Slope gradients range from 25 to 60 percent. Soils on these landforms are shallow, moderately deep and deep to bedrock. They are moderately and weakly developed with cobbly and very cobbly loam surface textures. The subsurface layers are very cobbly and extremely cobbly loams. These soils are classified as Typic and Lithic Cryochrepts and Cryoborolls, and Typic and Mollic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 50 percent of this LTA.

Mountain ridges are formed in residuum and colluvium over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Included in this component is rolling uplands found in the eastern portion of the Elkhorns. Slope gradients range from 10 to 40 percent. Soils on these landforms are mostly moderately deep and shallow to bedrock. They are moderately and weakly developed with cobbly, stony and very cobbly loam or loam surface textures. The subsurface layers are very cobbly, very stony, extremely

cobbly and extremely stony loams and clay loams. These soils are mostly

classified as Typic and Lithic Cryochrepts on forested sites and Argic and Lithic Cryoborolls on grassland/shrublands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is rough fescue, big sagebrush, Douglas-fir, and subalpine fir series. This component represents 50 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA68-M331Ah

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Beartooth Mountains of southwest Montana.

Acreage by Subsection:

68-M331Ah 3,211

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a dissected mountain landscape setting, which is typically composed of mountain slopes. Parent materials are residuum underlain by sandstone and shale bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep, with channery moderately fine to coarse textures. The vegetation is a mosaic of coniferous forest and mountain grassland. Mean annual precipitation ranges from 51 to 69 cms. (20 to 27 inches). The elevation range is 1525 to 2195 meters (5000 to 7200 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in residual sandstone and shale material. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow to moderately deep, moderately developed, channery moderately fine to coarse textured. These soils are classified as Typic Argiborolls, Lithic Haploborolls, and Typic Cryoboralfs. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, Douglas-fir, Idaho fescue and bluebunch wheatgrass. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA68-M331Aa
LTA68-M331Ap
LTA68-M332Dp

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This unit is located in the Bridger, Gallatin, and Madison Mountain Ranges in southwestern Montana.

Acreage by Section:

68-M331Aa	20,334
68-M331Ap	79,259
68-M332Dp	81,951

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of a complex of mountain slopes and ridges, with overall shapes controlled by underlying bedrock structure. Soil parent material is colluvium and residuum derived from thinly to thickly interbedded sandstone and shale with some limestone.

Accessory Characteristics: Vegetation is dense lower subalpine forest or mountain grassland. Elevation ranges from 1981 to 2377 meters (6500 to 7800 feet). Mean annual precipitation is 75 to 100 centimeters (30 to 40 inches). Slope ranges from 0 to 40 percent.

LTA Components: This landtype association has four components:

Soils in mountain grasslands are Typic Cryoborolls and Argic Cryoborolls. They are deep, medium to moderately fine textured, rocky in some areas, and have moderate to high fertility and water holding capacity. Rock outcrop makes up 5 percent of this component. Common potential vegetation includes Idaho fescue and big sagebrush series. This component makes up 20 percent of this LTA.

Where rock types are thinly interbedded sandstone and shale and vegetation is densely or sparsely forested, soils are Typic and Mollic Cryoboralfs and Argic Cryoborolls. They are deep, medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up 5 to 20 percent of this component. Common potential vegetation includes Douglas-fir, subalpine fir, Idaho fescue and big sagebrush series. This component makes up 40 percent of this LTA.

Where rock types are thickly interbedded sandstone and shale, and vegetation is densely or sparsely forested, soils are Typic and Mollic Cryoboralfs, Argic Cryoborolls, and Typic Argiborolls. They are deep, medium to moderately fine textured, non-rocky, and have high fertility and water holding capacity. Rock outcrop makes up 5 to 20 percent of this component. Common potential vegetation includes subalpine fir, subalpine fir-whitebark pine, Douglas-fir, Idaho fescue and big sagebrush series. This component makes up 20 percent of this LTA.

Where rock types are limestone, sandstone, and shale, soils are Typic Ustochrepts, Typic Calciborolls, Cryoboralfs and Cryochrepts. These soils are deep to moderately shallow, moderately coarse to moderately fine textured, rocky, and have low to moderate fertility and water holding capacity. Rock outcrop makes up 15 to 25 percent of this component. Common potential vegetation includes subalpine fir and Douglas-fir series. This component makes up 20 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA68-M331A
LTA68-M332E

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Lima Peaks (portion of Beaverhead Range), Tendoy, Pioneers, Tobacco Roots, Gravellys, and Madison Range in southwest Montana in the Jefferson and Madison Basins.

Acreage by Subsection:

68-M331A	49,804	(Section except M331Ah, M331Aa, M331Ap)
68-M332E	262,471	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting below the elevational zone of strong and moderate frost churning. This unit is typically composed of dissected slopes with ridges and narrow, mostly ephemeral, bottoms. Parent materials are Tertiary to Cambrian sediments undifferentiated, consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rock occurs.

Accessory Characteristics: The primary soils are moderately deep, loams, clay loams and silty clays. The vegetation is a mosaic of mountain grasslands and coniferous forests. Mean annual precipitation ranges from 41 to 91 centimeters (16 to 36 inches). The elevation range of this LTA is 2042 to 2682 meters (6700 to 8800 feet). The dominant slopes have gradients of 15 to 50 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being dendritic, but deranged in secondary mass wasting areas. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of slopes with rounded ridges and narrow, steep, mostly ephemeral valley bottoms.

Mountain slopes and ridges are formed in colluvium-alluvium and residuum of shale and sandstone parent materials. Slope gradients range from 15 to 50 percent. Soils on these landforms are moderately deep, moderately to highly developed, dark colored, clay loams, silty clays, and sandy loams and loams. These soils are classified as Argic Pachic Cryoborolls, Typic Cryoborolls, and Mollic and Typic Cryoboralfs. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Idaho fescue and Douglas-fir series. This component represents about 95 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead/Deerlodge National Forest

**LTA69-M331A
LTA69-M332E**

PEDIMENTS: MIXED GEOLOGY

Location: This LTA is located the Lima Peaks (Beaverhead Mountains), Tendoy, Gravellys, and southern Madison Range in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

69-M331A	412
69-M332E	2,408

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting below the elevational zone of strong and moderate frost churning. This unit is typically comprised of relatively undissected sloping and gently sloping straight to slightly concave slopes, often with a thin veneer of colluvium. Parent materials are mixed sedimentary, predominantly Cretaceous sediments consisting of shale, siltstone, sandstone, and subordinate conglomerate, limestone, and carbonaceous material, and including minor volcanic rock. The colluvial veneer is apparently Quaternary aged deposits.

Accessory Characteristics: The primary soils are shallow, well drained, gravelly loams. The vegetation is a mosaic of mountain grassland and coniferous forest. Mean annual precipitation ranges from 36 to 61 centimeters (14 to 24 inches). The elevation range of this LTA is 2042 to 2347 meters (6700 to 7700 feet). The dominant slopes have gradients of less than 20 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being parallel. Wetlands, lakes, and ponds are absent in this LTA.

LTA Components: This landtype association consists of relatively long, smooth, straight to slightly concave slopes.

Pediment slopes are formed in residuum of shale, sandstone, and limestone parent material. Slope gradients range from less than 10 to 20 percent. Soils on these landforms are shallow, moderately developed, gravelly loams. These soils are classified as Lithic Calciborolls and Typic Calciborolls. Rock outcrop typically does not occur on this landscape component. The dominant potential natural vegetation is the big sagebrush series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

**LTA72-M331A
LTA72-M332Dc
LTA72-M332Cp
LTA72-M332E**

**FROST SHATTERED MOUNTAIN RIDGE TOPS:
WEAKLY WEATHERED GRANITICS**

Location: This unit is located in the Gallatin, Madison, Absaroka-Beartooth mountain ranges in southwestern Montana. Included is the Crazy Mountains, Bridger Mountains, Anaconda Mountains, and Continental Divide Uplands.

Acreage by Section:

72-M331A	25,079
72-M332Dc	1,571
72-M332Dp	106
72-M332E	838

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of rounded ridgetops with weak stream dissection. Soil parent material is frost shattered glacial till and colluvium derived from hard crystalline rocks such as granite.

Accessory Characteristics: Vegetation is alpine turf or sparse to dense upper subalpine and lower subalpine forest. Elevation ranges from 1981 to 2987 meters (6500 to 9800 feet). Mean annual precipitation is greater than 125 centimeters (50 inches). Slopes range from 0 to 20 percent.

LTA Components: This landtype association has two components:

Soils on rounded ridgetops in forest are Typic and Dystric Cryochrepts. They are deep, moderately coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up five percent of this component. The dominant potential natural vegetation is the subalpine fir, and subalpine fir-whitebark pine series. This component makes up 70 percent of this LTA.

Soils on rounded ridgetops with alpine turf are Dystric Cryochrepts. They are moderately deep, coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 percent of this component. A common potential natural vegetation series is Idahofescue. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA73-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This unit is located in the Gallatin and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section:

73-M331A	16,886

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of rounded ridgetops with weak stream dissection. Soil parent material is frost shattered glacial till and colluvium derived from andesitic volcanic rocks.

Accessory Characteristics: Vegetation is alpine turf or sparse to dense upper subalpine and lower subalpine forest interspersed with mountain meadows. Elevation ranges from 2195 to 2987 meters (7200 to 9800 feet). Mean annual precipitation is 75 to greater than 125 centimeters (30 to greater than 50 inches). Slope ranges from 0 to 20 percent.

LTA components: This landtype association has two components:

Soils on rounded ridgetops in forest are Mollic Cryoboralfs. They are deep, medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. Common potential natural vegetation is the Idaho fescue, subalpine fir, and subalpine fir-whitebark pine series. This component makes up 70 percent of this LTA.

Soils on rounded ridgetops with alpine turf are Argic Cryoborolls and Typic Cryochrepts. They are deep to shallow, medium textured, rocky and have low to moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. A common potential natural vegetation is the Idaho fescue series. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

**LTA74-M331A
LTA74-M332D
LTA74-M332E**

**FROST SHATTERED MOUNTAIN RIDGE TOPS:
SANDSTONES AND SHALES**

Location: This LTA is located in the Pioneers, Fleecers, Beaverhead Mountains, (south), Tendoy, Tobacco Roots, Gravellys, and Madison Ranges. These occur in southwest Montana on the Beaverhead-Deerlodge National Forest in the Jefferson and Madison Basins.

Acreage by Section:

74-M331A	10,729
74-M332D	859
74-M332E	70,884

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattered. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from Tertiary sediments consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rocks occur.

Accessory Characteristics: The primary soils are very shallow to moderately deep silt loams, loams and clay loams. The vegetation is a mosaic of alpine turf, alpine and subalpine coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 41 to 127 centimeters (16 to 50 inches). The elevation range of this LTA is 2195 to 3048 meters (7200 to 10000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in colluvium and residuum derived from sandstones and shales. Slope gradients range from 10 to 50 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately well developed, silt loams, loams, and clay loams. The surface soils can be highly organic above 9000 feet (2743 meters). These soils are classified as Lithic Cryoborolls and Typic Cryoborolls, Typic Cryochrepts, and Mollic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, subalpine fir, Douglas-fir, and subalpine fir-whitebark pine series with sedges and rushes. This component represents 95 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA77-M331Ah

FROST SHATTERED MOUNTAIN RIDGE TOPS: GNEISSES AND SCHISTS

Location: This LTA is located in the Beartooth Mountains of southwest Montana.

Acreage by Subsection:

77-M331Ah 44,401

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a high elevation mountain landscape setting, typically composed of frost shattered ridge tops. Parent materials are residuum underlain by weakly metamorphosed, gneiss and schist bedrock with some loess (wind blown silt) on the surface.

Accessory Characteristics: The primary soils are shallow, with medium textures. The vegetation is a mosaic of alpine turfs and scattered whitebark pine stands. Mean annual precipitation ranges from 89 to 152cms. (35 to 60 inches). The elevation range is 2743 to 3292 meters (9000 to 10800 feet). The dominant slopes have gradients of 0 to 20 percent.

LTA Components: This landtype association consists of frost shattered ridge tops.

Frost shattered ridges tops are formed in residual gneiss and schist material. Slope gradients range from 0 to 20 percent. Soils on these landforms are shallow, weakly developed, medium textured. These soils are classified as Lithic Cryochrepts. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is alpine turf consisting of tufted hairgrass, fescues, bluegrass and sedges. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest and Henry Shovic, Gallatin National Forest

LTA77-M331A
LTA77-M332E

FROST SHATTERED MOUNTAIN RIDGE TOPS: GNEISSES AND SCHISTS

Location: This LTA is located the Tobacco Root and Madison Ranges in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

77-M331A	18,510 (Section except M331Ah)
77-M332E	18,667

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diabase, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite, and migmatite.

Accessory Characteristics: The primary soils are shallow to moderately deep, channery loams and sandy loams. The vegetation is a mosaic of alpine turf, talus, subalpine and montane coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 41 to 91 centimeters (16 to 36 inches). The elevation range of this LTA is 2134 to 2743 meters (7000 to 9000 feet). The dominant slopes have gradients of 20 to 40 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in colluvium and residuum derived from gneiss/schist. Slope gradients range from 15 to 40 percent. Soils on these landforms are moderately deep, well drained, weakly to moderately developed, channery sandy loams. These soils are classified as Lithic and Typic Cryoborolls, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, subalpine fir and Douglas-fir series with several sedges. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA90-M331Am
LTA90-M331Ap
LTA90-M332E

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located in the Madison, Tobacco Root, Fleece, Pioneer, Anaconda Pintlar, Beaverhead, Lima Peaks, and Tendoy Mountains of southwest Montana in the Jefferson and Madison Basins.

Acreage by Section:

90-M331Am	11,231
90-M331Ap	55,734
90-M332E	25,903 (Section except M332Ea, M332Eb, M332En)

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a foothills to mountain landscape setting which is typically composed of deep bedrock (hundreds of feet thick) and surficial (tens of feet thick) mass failures, both translational and rotational. Parent materials are landslide deposits, colluvium, and residuum derived mostly from Cretaceous and Tertiary shales and sandstones.

Accessory Characteristics: The primary soils are deep, silty clay loams, silty clays, and clays. The vegetation is a mosaic of subalpine coniferous forest, montane coniferous forest, and subalpine and mountain grasslands. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 2012 to 2804 meters (6600 to 9200 feet). The dominant slopes have gradients of 20 to 35 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being deranged to dendritic. Wetlands and small ponds are a major component of this LTA.

LTA Components: This landtype association consists of scarp slopes and landslide deposits.

Scarp slopes are formed in colluvium, residuum, and sometimes old glacial deposits. Slope gradients range from 20 to 70 percent. Soils on these landforms are very shallow to shallow, weakly developed, channery and flaggy sandy loams, loamy fine sands, clay loams, and silty clays, and clays. These soils are classified as Typic Cryorthents and Typic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir and tufted hairgrass series with numerous early successional forb communities and primary succession. This component represents 10 percent of this LTA.

Landslide deposits and mountain slopes are formed in colluvium, residuum, old landslide deposits, and sometimes old glacial deposits (Bull Lake). Slope gradients range from 10 to 50 percent. Soils on these landforms are deep, moderately well developed, silty clay loams, silty clays and clays. These soils are classified as Aquic, Mollic, and Typic Cryoboralfs, Typic Argiborolls, and Argic Pachic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential vegetation is tufted hairgrass, whitebark pine, spruce, subalpine fir, aspen and Idaho fescue series. This component represents 85 percent of this landscape component.

Compiled by: Dan Svoboda, Beaverhead/Deer Lodge National Forest

LTA90-M331A

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This map unit occurs throughout the Gallatin National Forest, in southwestern Montana and in the Beartooth Mountains on the Custer National Forest.

Acreage by Section:

90-M331A 46,492 (rest of Section except M331Am, M331Ap)

LTA Setting and General Characteristics:

Differentiating Characteristics: This map unit consists of large earthflows. Parent material is landslide deposits derived from interbedded sandstone, limestone, and shale; or andesitic volcanic rocks.

Accessory Characteristics: Vegetation is dense upper or lower subalpine forest, dense to sparse Douglas-fir forest, mountain grasslands, and meadows. Elevation ranges from 1676 to 2316 meters (5500 to 7600 feet). Mean annual precipitation is 53 to 74 cms. (21 to 29 inches). Slope ranges from 0 to 60 percent.

LTA Components: This landtype association has two components:

Where forest is sparse to dense Douglas-fir forest and grasslands, soils are Argic Cryoborolls, Mollic Cryoborolls, and Argic Pachic Cryoborolls. These soils are moderately fine to fine textured, rocky and nonrocky, and have moderate to high fertility and water holding capacity. Some areas have Typic Cryorthents, Lithic Cryorthents, or Vertic Haploborolls. Common potential natural vegetation includes Idaho fescue, big sagebrush and Douglas-fir series. This component makes up 20 percent of this LTA.

Where forest is dense upper or lower subalpine forest and meadows, soils are Cryoborolls and some Cryoborolls. These soils are moderately fine to fine textured, rocky and non-rocky, and have moderate to high fertility and water holding capacity. Common potential natural vegetation includes subalpine fir, subalpine fir-whitebark pine, and Idaho fescue series. This component makes up 80 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

CHAPTER 5

LTA Descriptions

Section M332A Idaho Batholith

This Section occurs mostly in central Idaho extending a short distance into west central Montana. It generally coincides with the Idaho Batholith Uplands geomorphic area previously described. Thirty two LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. The map unit descriptions are preceded by the following illustrations:

Figure 15: Map showing location of M332A within the Northern Region

Figure 16: M332A landscape photograph of Bitterroot Mountain Range, Bitterroot National Forest

Figure 17: Map showing distribution of LTAS within M332A

Figure 18: Bar chart showing abundance of major landform groups within M332A

Figure 19: Bar chart showing abundance of major geologic material groups within M332A

LTA10-M332A

VALLEYS: RECENT, COARSE ALLUVIUM

Location: This unit is located in valley bottoms along larger streams in north central Idaho, in the Salmon and Clearwater River Basins.

Acreage by Section

10-M332A	9,587

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on valley bottom landscape settings and consists of floodplains and terraces. Parent materials are recent alluvial deposits derived from granite, schist, quartzite, or gneiss.

Accessory Characteristics: The primary soils are very deep loams or silt loams over gravelly or cobbly sand or loamy sand substrata. The vegetation is a mosaic of coniferous forest, wet meadows, and hardwood forest or shrubland. Mean annual precipitation ranges from 50 to 100 centimeters (20 to 40 inches). The elevation range is 550 to 1600 meters (1800 to 5300 feet). The dominant slopes gradients are 0 to 10 percent. This unit is moderately dissected by streams; the dominant stream pattern is dendritic. Wetlands are a major component of this unit.

LTA Components: This landtype association consists of stream terraces and floodplains.

Stream terraces are formed in mixed coarse textured alluvium. Slope gradients range from 1 to 10 percent. Soils on this landform are very deep and moderately well drained to somewhat poorly drained. These soils are weakly to moderately developed loams and silt loams over sand and gravel to cobble-sized rocks. The dominant soils are classified as Entic or Aquic Cryumbrepts, frigid Hapumbrepts, and Andic Cryochrepts. Rock outcrops do not occur in this landscape component. The dominant potential natural vegetation is mixed hardwoods at low elevations, and subalpine fir at higher elevations. This component represents about 50 percent of this unit.

Floodplains are formed in mixed volcanic ash influenced loess and gravelly or cobbly, sandy recent alluvium. Slope gradients range from 1 to 3 percent. Soils on this landform are very deep and poorly drained. These soils are weakly developed and consist mostly of cobbles, gravels and sands. The dominant soils are classified as Typic Fluvaquents and Humic Cryaquents. Rock outcrop does not occur on this landscape component. Areas of cobbly to gravelly riverwash make up about 10 percent of this unit. The dominant vegetation is a complex of sedge meadow, willow, or subalpine fir. This component represents about 40 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA12-M332A

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIUM

Location: This unit is located in major river valleys in north central Idaho in the Salmon and Clearwater River Basins.

Acreage by Section

12-M332A	10,308

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on valley bottoms of canyon breaklands and is dominated by old high terraces. These occur with low flood plains and alluvial fans. Parent materials are mixed alluvium underlain by undifferentiated lithology.

Accessory Characteristics: The primary soils are very deep sands, sandy loams, and loams over cobbles and gravels. The vegetation is a mosaic of grassland and coniferous forest with some unvegetated cobble and sand bars. Mean annual precipitation ranges from 51 to 64 centimeters (15 to 25 inches). The elevation range is 450 to 750 meters (1200 to 2500 feet). The dominant slopes have gradients of 1 to 30 percent. This unit is adjacent to large rivers and may be dissected by smaller streams. In low floodplains and fans, wetlands and cobble and sand bars are numerous.

LTA Components: This landtype association consists of floodplains, older terraces, and alluvial fans.

Old terraces are formed in old alluvium and loess. Slope gradients range from 1 percent on terrace floors to near vertical on truncated terrace faces. Soils on these landforms are very deep, moderately developed sandy loams and loams with loamy substrata. These soils are classified as Calcic Haploxerolls. Rock outcrop is uncommon. The dominant potential natural vegetation is bluebunch wheatgrass or ponderosa pine. This component represents 65 percent of this unit.

Floodplains are formed in recent alluvium of mixed lithology. Slope gradients range from 1 to 3 percent. Soils on these landforms are deep to very deep, poorly developed stratified sands, gravels, cobbles and some fine material. These soils are classified as cobbly Typic Xerofluvents. Rock outcrop is uncommon. The dominant potential natural vegetation is bluebunch wheatgrass or ponderosa pine. This component represents 20 percent of this unit.

Alluvial fans are formed in coarse recent alluvium at the mouth of tributary streams. Slope gradients range from 5 to 30 percent. Soils on these landforms are very deep, poorly developed, poorly stratified sands, gravels, cobbles and boulders. These soils are classified as cobbly Typic Xerofluvents and Udi fluvents. Rock outcrop is uncommon. Plant communities are often dominated by willow, cottonwood, and white alder near streams and Douglas-fir or ponderosa pine series on drier positions. This component represents 15 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA14-M332A

VALLEYS: RECENT FINE ALLUVIUM

Location: This unit is located in the Bitterroot Mountains of Idaho west of the Montana border in the upper Lochsa River Basin.

Acreage by Section

14-M332A	8,101

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting, which is typically composed of floodplains, alluvial basins, and stream terraces. Parent materials are recent, fine, alluvial deposits primarily underlain by granitics of the Idaho Batholith

Accessory Characteristics: The primary soils are moderately deep to deep with moderately fine to fine textures. The vegetation is a mosaic of moist to wet coniferous forest, riparian shrub communities, and mesic to wet meadows. Mean annual precipitation ranges from 89 to 114 cms. (35 to 45 inches). The elevation range is 914 to 1372 meters (3500 to 4500 feet). The dominant slopes have gradients of 0 to 10 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a major component of this unit.

LTA Components: This landtype association consists of flood plains, alluvial basins, and stream terraces.

Flood plains and alluvial basins are formed in moderately fine-textured recent alluvium. Slope gradients range from 0 to 3 percent. Soils on these landforms are deep, weakly to moderately developed, and consist mostly of silt loam and silty clay loam textures. These soils are classified as Typic Cryaquepts, Aquic Cryochrepts, and Cumulic Cryaquolls. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation are mesic to wet grass/sedge associations, willow/alder associations, and western redcedar/subalpine fir series. This component represents 80 percent of this unit.

Stream terraces are formed in mixed alluvium. Slope gradients range from 2 to 10 percent. Soils on these landforms are deep, weakly developed, and consist mostly of medium to moderately fine textures. These soils are classified as Typic Eutrochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation series are western redcedar, grand fir, and subalpine fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA20-M332A

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot Mountains of Idaho west of the Montana border in the upper Lochsa River Basin.

Acreage by Section

20-M332A	8,071

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are mixed Mazama volcanic ash underlain by highly metamorphosed metasediments of the Belt Series.

Accessory Characteristics: The primary soils are shallow to deep with textures ranging from silt loams to very gravelly loams. The vegetation is primarily coniferous forest with numerous rock outcrops. Mean annual precipitation ranges from 89 to 114 cms. (35 to 45 inches). The elevation range is 1067 to 1676 meters (3500 to 5500 feet). The dominant slopes have gradients of 60 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks, some of which formed along structural breaks.

Stream breaks are formed in colluvial materials from highly weathered metasedimentary Belt Series rocks with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Dystrochrepts, Andic Dystrochrepts, and Vitrandic Dystrochrepts. Rock outcrop occurs on 10 to 30 percent of this landscape component. The dominant potential natural vegetation series are western redcedar and grand fir. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA21-M332A

BREAKS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater and Bitterroot Mountains of north-central Idaho in the Lochsa, Selway, and Salmon River Basins.

Acreage by Section

21-M332A	209,877

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are a mixed Mazama volcanic ashcap of variable thickness underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to and deep with textures ranging from silt loams to extremely gravelly sandy loams and loamy sands. The vegetation is primarily coniferous forest with numerous rock outcrops. Mean annual precipitation ranges from 51 to 152 cms. (20 to 60 inches). The elevation range is 762 to 2286 meters (2500 to 7500 feet). The dominant slopes have gradients of 60 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component on valley floors.

LTA Components: This landtype association consists primarily of stream breaks, some of which formed along structural breaks.

Stream breaks are formed in colluvial materials from highly weathered granitic rocks of the Idaho Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow to deep, weakly developed with silt loam to gravelly sandy loam surface textures and very gravelly to extremely gravelly or cobbly to extremely cobbly loamy sand to sandy clay loam subsurface textures. These soils are classified as Typic Dystrochrepts, Vitrandic Dystrochrepts, Typic Ustochrepts, and Dystric Cryochrepts. Rock outcrop occurs on 20 to 40 percent of this landscape component. The dominant potential natural vegetation series are western redcedar, grand fir, Douglas-fir, and subalpine fir. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest, and Ken McBride, Bitterroot National Forest

LTA22-M332A

BREAKS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater and Bitterroot Mountains and of central Idaho in the Clearwater and Salmon River Basins.

Acreage by Section

22-M332A	283,624

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded or faulted landscape setting which is typically composed of structural and stream breaks. Parent material is colluvium and residuum derived from weakly weathered granitic and gneissic bedrock.

Accessory Characteristics: The primary soils are shallow to very deep with very gravelly, very cobbly or extremely gravelly coarse to medium textures. The vegetation is a mosaic of grassland, shrublands, and dry coniferous forest. Mean annual precipitation ranges from 51 to 76 cms. (15 to 45 inches). The elevation range is 853 to 2134 meters (2500 to 7500 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Rock outcrop, talus, and scree combined, are major components of this map unit. Wetlands are a minor component of this unit. Wide valley bottoms occur in this unit, but are generally considered only map unit inclusions.

LTA Components: This landtype association consists of structural and stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 60 to 90 percent. Soils on these landforms are shallow to very deep and well drained. These soils are weakly developed and consist of loam to very gravelly sandy loam surfaces overlying gravelly to extremely gravelly sandy loam or loamy sand substrata. The dominant soils at low to mid elevations are classified as Typic and Lithic Ustochrepts, Ultic Haploxerolls, and Typic Udivitrands. At high elevations, Dystric Cryochrepts occur. Rock outcrop, talus and scree occupy up to about 25 percent of this map unit. The dominant natural potential vegetation at low elevations includes Idaho fescue, bluebunch wheatgrass or shrublands (generally found on shallow soils, rock outcrop, talus, or scree) including curl-leaf mountain mahogany. The dry coniferous forest plant associations are ponderosa pine and Douglas-fir. In moist settings grand fir occurs. In the northwest part of this section, western redcedar occurs and at high elevations, subalpine fir occurs.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA23-M332A

BREAKS: SCHISTS AND GNEISSES

Location: This unit is located in the Clearwater Mountains of north-central Idaho in the lower Selway River Basin.

Acreage by Section

23-M332A	129,750

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are moderately weathered gneisses and schists with a variable thickness of Mazama volcanic ash.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very gravelly loams. The vegetation is a mosaic of coniferous forest with numerous rock outcrops and grassy openings. Mean annual precipitation ranges from 64 to 89 cms. (25 to 35 inches). The elevation range is 366 to 1524 meters (1200 to 5000 feet). The dominant slopes have gradients of 60 to 100 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks, some of which formed along structural breaks.

Stream breaks are formed in colluvial materials from moderately weathered gneisses and schists with a variable thickness of Mazama volcanic ash mixed in the surface layer. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, and Andic Dystrochrepts. Rock outcrop occurs on 10 to 30 percent of this landscape component. The dominant potential natural vegetation series are Douglas-fir, grand fir, and Idaho fescue. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA24-M332A

BREAKS: VOLCANICS

Location: This unit is located in the Clearwater River Basin of west-central Idaho.

Acreage by Section

24-M332A	11,592

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream breaklands. Parent materials are weakly to moderately weathered Columbia flood basalts overlain with a variable thickness of wind-blown loess.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very cobbly loams. The vegetation is a mosaic of grasslands with some shrubland inclusions. Mean annual precipitation ranges from 51 to 76 cms. (20 to 30 inches). The elevation range is 458 to 914 meters (1500 to 3000 feet). The dominant slopes have gradients of 60 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks.

Stream breaks are formed in colluvial materials from weakly to moderately weathered Columbia flood basalts with a variable layer of loess mixed in the surface layer. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Haploxerolls, Lithic Argixerolls, and Ultic Argixerolls. Rock outcrop occurs on 20 to 40 percent of this landscape component. The dominant potential natural vegetation series are Idaho fescue, bluebunch wheatgrass, with ponderosa pine and Douglas-fir present in the moister settings. This component represents 90 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA26-M332A

BREAKS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located along streams and rivers in north central and central Idaho.

Acreage by Section

26-M332A	215,945

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of dissected stream breaks. Parent materials are moderately weathered gneiss, quartzite, and schist associated with the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep sandy loams and loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 46 to 114 centimeters (18 to 45 inches). The elevation range is 550 to 2000 meters (1800 to 6600 feet). The dominant slopes have gradients of 50 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in mixed volcanic ash influenced loess, residuum and colluvium of felsic metamorphic lithology. Soils on these landforms are moderately deep to very deep, moderately developed loams and sandy loams with sandy or loamy substrata. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass and Idaho fescue, at mid-elevations Douglas-fir and grand fir, and at high elevations, subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA29-M332A

BREAKS: QUARTZITES AND CALC-SILICATES

Location: This unit is located in the Bitterroot Mountains and occurs in the Selway River Basin of central Idaho.

Acreage by Section

29-M332A	10,533

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded or faulted landscape setting which is typically composed of structural and stream breaks. Parent material is colluvium and residuum derived from weakly weathered quartzite and calc-silicates of the Belt Supergroup.

Accessory Characteristics: The primary soils are shallow to deep with very gravelly, very cobbly or extremely gravelly coarse to medium textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 63 to 102 centimeters (25 to 40 inches). The elevation range is 914 to 2073 meters (3000 to 6800 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Rock outcrop, talus, and scree combined, are major components of this map unit. Wetlands are a minor component of this unit. Wide valley bottoms occur in this unit, but are generally considered only map unit inclusions.

LTA Components: This landtype association consists of structural and stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to deep and well drained. These soils are weakly developed, and consist of very cobbly loam surfaces overlying very cobbly sandy loam substrata. The dominant soils are classified as: Typic and Lithic Ustochrepts, Typic Eutroboralfs, Lithic Argiborolls, and Dystric and Lithic Cryochrepts. Rock outcrop, talus and scree occupy about 20 percent of this map unit. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. On cool, mesic sites it is subalpine fir series. Stream and structural breaks represent about 85 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA39-M332A

STEEP GLACIATED MOUNTAIN SLOPES: GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in high elevation glaciated areas of north central and central Idaho in the Salmon River and Selway River basin.

Acreage by Section

39-M332A	42,652

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of steep glacial trough walls and cirques. Parent materials are poorly weathered gneiss, quartzite, and schist associated with the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to deep gravelly sandy loams and loams. The vegetation is coniferous forest with inclusions of shrub or herbaceous dominated openings. Mean annual precipitation ranges from 76 to 119 centimeters (30 to 47 inches). The elevation range is 1250 to 2500 meters (4100 to 8200 feet). The dominant slopes have gradients of 50 percent to near vertical. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands and lakes are significant inclusions in basins and toeslopes.

LTA Components: This landtype association consists of dissected trough walls and cirque headwalls.

Dissected troughwalls are formed in mixed volcanic ash influenced loess, till, residuum and colluvium of felsic metamorphic lithology. Slope gradients range from 50 to 80 percent. Soils on these landforms are moderately deep to deep, weakly developed gravelly loams and sandy loams with cobbly sand substrata. These soils are classified as Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir, and at high elevations - subalpine fir.

Cirque headwalls are formed in till, residuum, and colluvium of acid metamorphic lithology. Slope gradients range from 50 percent to near vertical. Soils on these landforms are shallow to moderately deep, weakly developed gravelly loams and sandy loams with cobbly sand substrata. These soils are classified as Dystric Cryochrepts and Entic Cryumbrepts. Rock outcrop may be 50 percent of the unit. The dominant potential natural vegetation is subalpine fir, whitebark pine/subalpine fir, and herbaceous or shrub dominated openings.

Compiled by: Pat Green, Nez Perce National Forest

LTA40-M332A

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot Mountains of Idaho west of the Montana border in the upper Lochsa River Basin.

Acreage by Section

40-M332A	4,758

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a steep, alpine glacial landscape setting, which is typically composed of steep glacial slopes and headwalls. Parent materials are Mazama volcanic ash underlain by Belt Series metasediments composed of quartzites, siltites, and argillites.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of coniferous forest, subalpine meadows, and rock outcrops. Mean annual precipitation ranges from 102 to 165 cms. (40 to 65 inches). The elevation range is 1524 to 2134 meters (5000 to 7000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and subalpine ponds are a major component of this unit.

LTA Components: This landtype association consists of a complex of steep, alpine glaciased slopes and headwalls intermixed across the landscape.

Steep, alpine, glaciased slopes and headwalls are formed in Belt Series metasediments with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 30 to 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and very gravelly, cobbly, and bouldery loamy subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Vitric Haplocryands. Rock outcrop occurs on 20 to 50 percent of this landscape component. The dominant potential natural vegetation are subalpine fir, whitebark pine, and wet grass/sedge meadows.

Compiled by: Jim Mital, Clearwater National Forest

LTA41-M332A

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit occurs in the Bitterroot Mountain Range, within the Salmon and Clearwater River basins in central Idaho.

Acreage by Section

41-M332A	401,415

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on steep and very steep alpine glacial landscape settings. Parent material is colluvium, residuum, and scattered alpine glacial till, derived from granitic sources.

Accessory Characteristics: The primary soils are shallow to deep, coarse textured, and contain numerous rock fragments throughout the profile. Additionally, avalanche chutes, rock outcrop, and rubbleland are major components to this map unit. The vegetation is a mosaic of closed to open coniferous forest, and moist shrublands. Mean annual precipitation ranges from 46 to 178 cms. (18 to 70 inches). The elevation range is 1219 to 2896 meters (4000 to 9500 feet). The dominant slopes have gradients of 15 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands (wet sidehills and avalanche chutes), lakes, and ponds are major components of this unit.

LTA Components: This landtype association consists of glacial trough walls, alpine ridges, and cirques (headwalls and basins).

Glacial trough walls were formed by alpine glacial scouring. After the glaciers retreated the walls were further modified by avalanches creating avalanche chutes. Slope gradients range from 50 to 100 percent and slope shape is straight to concave. Soils on this landform are shallow to deep and poorly to somewhat excessively drained. These soils are weakly developed, and consist of very cobbly loam or gravelly sandy loam surfaces overlying very cobbly loamy sand or very cobbly sandy loam substrata. The dominant soils are classified as: Lithic Cryochrepts, Andic Cryochrepts, Dystric Cryochrepts, Lithic Ustochrepts, and Typic Ustochrepts. Typic Cryaquands comprise extensive areas on northerly aspects in the headwater portions of these troughs. Rock outcrop, rubbleland, and avalanche chutes occupy about 45 percent of this component. The most common potential natural vegetation series are Douglas-fir and grand fir at moderate elevations, and subalpine fir and alpine larch-subalpine fir at higher elevations. Avalanche chutes have a sitka alder community type. The Typic Cryaquands soils that occur in the headwaters portion of trough walls support sitka alder. This landform component represents about 60 percent of this unit.

Cirque headwalls and basins were formed by alpine glacial erosion. Cirque basins have slope gradients of 15 to 60 percent and slope shapes are convex to concave. Cirque headwalls have slope gradients greater than 60 percent (approaching vertical) and slope shapes are concave. Soils on this landform are shallow to very deep, and very poorly drained to well drained. These soils are weakly developed and consist of extremely bouldery silt loam volcanic ash surfaces over very cobbly loamy sand substrata. The dominant soils on cirque headwalls are classified as Andic Cryochrepts and Lithic Cryochrepts. Soils on cirque basins are classified as Typic Cryandeps and Histic Cryaquepts. Rock outcrop, talus, and scree occupy about 40 percent of this component. The dominant natural vegetation series are: alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir. Holm's Rocky Mountain sedge and beaked

sedge occur on very poorly drained to ponded alluvial basins. This landform represents about 25 percent of this unit.

Alpine ridges were formed by alpine glacial scouring and/or strong periglacial frost shattering of exposed bedrock. Slope gradients range from 50 to 80 percent and slope shape is convex. Soils on this landform are shallow and somewhat excessively drained. These soils are weakly developed and consist of very stony sandy loam surfaces overlying extremely stony loamy sand substrata. Bedrock occurs at a depth of less than 20 inches. The dominant soil is classified as Lithic Cryorthents; however, only about 20 percent of this landform has a soil cover. Rock outcrop, talus, and scree occupy about 80 percent of this component. The most common plant associations are alpine larch-subalpine fir and whitebark pine-subalpine fir. This landform represents about 15 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA45-M332A

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES: GRANITICS

Location: This unit is located in the Bitterroot Mountain Range in the Upper Selway River Basin of central Idaho.

Acreage by Section

45-M332A	71,072

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation broad ridgetop position which is typically composed of weakly expressed glaciated slopes and basins that were formed by ice cap glaciers, minor valley glaciers, and strong periglacial frost shattering. Parent materials are a complex of frost shattered residuum and colluvium, intermixed with glacial till derived from moderately weathered granite.

Accessory Characteristics: The primary soils are shallow and very deep, coarse soils with numerous rock fragments and have a volcanic ash surface layer. The vegetation is a mosaic of coniferous forest, stunted, wind-deformed forest, and occasional small wet meadows. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 2073 to 2591 meters (6800 to 8500 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of weakly developed glacial cirques, and frost shattered mountain ridgetops.

Weakly developed glacial cirques are formed in residuum, colluvium, and till derived from a variety of rock types. Slope gradients range from 20 to 55 percent. Soils on this landform are shallow to very deep and somewhat excessively drained. These soils are weakly developed and consist of extremely bouldery loam volcanic ash surface layers overlying very stony loamy sand substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir series. This component represents 65 percent of this unit.

Frost shattered mountain ridgetops are formed in residuum and colluvium. Slope gradients range from 20 to 50 percent. Soils on this landform are shallow to very deep and somewhat excessively drained. These soils are weakly developed and consist of very stony loam volcanic ash surface layers overlying very cobbly coarse sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, alpine larch-subalpine fir, and subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA46-M332A

ALPINE TROUGHS AND TROUGHWALLS: GRANITIC

Location: This unit is located in the Bitterroot Mountains of Idaho in the upper Lochsa and Selway River Basins.

Acreage by Section

46-M332A	35,567

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at higher elevations, in a gentle to steep, alpine glacial landscape setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are Mazama volcanic ash overlying weakly weathered granitic tills and bedrock of the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of coniferous forest and rock outcrops. Mean annual precipitation ranges from 127 to 203cms (50 to 80 inches). The elevation range is 1219 to 1981 meters (4000 to 6500 feet). The dominant slopes have range from 1 percent in the trough bottoms to more than 60 percent on the troughwalls. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and moist seeps a major component of this unit.

LTA Components: This landtype association consists of glacial troughwalls, and glacial trough bottoms.

The glacial troughwalls are formed in granitics of the Idaho Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 40 to more than 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and very gravelly, cobbly, and bouldery loamy subsurface textures. These soils are classified as Andic Cryochrepts, Typic Cryochrepts, and Dystric Cryochrepts. Rock outcrop occurs on 10 to 30 percent of this landscape component. The dominant potential natural vegetation are subalpine fir, grand fir, and alder communities in moist seeps. This component represents about 70 percent of this unit.

The trough bottoms consist of glacial tills and glacio-fluvial materials from Idaho Batholith granitics with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and mostly unstratified very gravelly, and cobbly, loamy subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Haplocryands. Rock outcrops are uncommon. The dominant potential natural vegetation are subalpine fir, grass/sedge associations, and alder communities in moist seeps and wetlands. This component represents about 30 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA47-M332A

ALPINE TROUGHS AND TROUGHWALLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot Mountains of Idaho in the upper Lochsa River Basin.

Acreage by Section

47-M332A	6,809

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at higher elevations, in a gentle to steep, alpine glacial landscape setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are Mazama volcanic ash overlying weakly weathered Belt series tills and bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of coniferous forest and rock outcrops. Mean annual precipitation ranges from 127 to 203 cms. (50 to 80 inches). The elevation range is 1219 to 1981 meters (4000 to 6500 feet). The dominant slopes have range from 1 percent in the trough bottoms to more than 60 percent on the troughwalls. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and moist seeps are a major component of this unit.

LTA Components: This landtype association consists of glacial troughwalls, and glacial trough bottoms.

The glacial troughwalls are formed in Belt metasediments with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 40 to more than 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and very gravelly, cobbly, and bouldery loamy subsurface textures. These soils are classified as Andic Cryochrepts, Typic Cryochrepts, and Dystric Cryochrepts. Rock outcrop occurs on 10 to 30 per cent of this landscape component. The dominant potential natural vegetation are subalpine fir, grand fir, and alder communities in moist seeps. This component represents about 65 percent of this unit.

The trough bottoms consist of glacial tills and glaciofluvial materials from Belt metasediments with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and mostly unstratified very gravelly, and cobbly, loamy subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Haplocryands. Rock outcrops are uncommon. The dominant potential natural vegetation are subalpine fir, grass/sedge associations, and alder communities in moist seeps and wetlands. This component represents about 25 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA51-M332A

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Bitterroot Mountain Range and occurs in the Selway River Basin of central Idaho.

Acreeage by Section

51-M332A	281,987

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on gently to moderately sloping glacial landscape settings. Parent material is alpine glacial till, alluvium, and residuum derived from granitic sources.

Accessory Characteristics: The primary soils are deep and very deep with coarse to moderately coarse textures. Small inclusions of shallow soils, rock outcrop, and rubble land can also be found within this unit. The vegetation is a mosaic of moderately dry, moist, and wet (riparian types) coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range is 1372 to 2256 meters (4500 to 7400 feet). Slope gradients range from 1 to 50 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands, seeps, bogs and riparian zones are major components of this unit.

LTA Components: This landtype association consists of glacial moraines, and floodplains.

Glacial moraines were formed by alpine glacial till. Slope gradients range from 8 to 50 percent and slope shape is convex. Soils on this landform are shallow to deep, and moderately well to somewhat excessively drained. These soils are weakly developed and consist of bouldery loam volcanic ash surface layers overlying very cobbly loamy sand substrata. The dominant soils are classified as: Andic Cryochrepts, Lithic Cryochrepts, Lithic Ustochrepts, and Typic Ustochrepts. Rock outcrop and rubble land occupy about 10 percent of this component. The dominant potential natural vegetation are subalpine fir and Douglas-fir series. This landform component represents about 75 percent of this unit.

Floodplains were formed in coarse alluvium. Slope gradients range from 1 to 8 percent. Soils on this landform are very deep and moderately well to very poorly drained. These soils are very weakly develop and consist of cobbly loam surface layers overlying very cobbly loamy sand substrata. The dominant soils are classified as Typic Cryaquents, Oxyaquic Cryofluvents, and Andic Cryofluvents. Rock outcrop occurs on less than 5 percent of this component. The dominant potential natural vegetation is wester redcedar, grand fir and subalpine fir. This landform represents about 25 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA57-M332A
LTA57-M333D

**GLACIATED MOUNTAIN SLOPES:
GNEISSES, QUARTZITES, AND SCHISTS**

Location: This unit is located in mid to high elevation glaciated areas of north central Idaho in the Salmon and Clearwater River basins.

Acreage by Section

57-M332A	54,631
57-M333D	9,130

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of gently to moderately sloping alpine glaciated lands, including moraines, cirque basins, and trough bottoms. Parent materials are poorly weathered gneiss, quartzite, and schist associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams, loams and sandy loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 89 to 127 centimeters (35 to 50 inches). The elevation range is 1700 to 2500 meters (5500 to 8200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being pinnate. Wetlands and lakes are significant inclusions in basins and depressions.

LTA Components: This landtype association consists of moraines, cirque basins, and trough bottoms.

Moraines are formed in volcanic ash influenced loess and glacial till of felsic metamorphic lithology. Slope gradients range from 5 to 50 percent. Soils on these landforms are moderately deep to very deep, weakly developed silt loams and gravelly sandy loams with cobbly loamy sand substrata. These soils are classified as Andic Cryochrepts and Dystric Cryochrepts, and Andic Cryumbrepts. Rock outcrop is less than 15 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir, and at high elevations subalpine fir. This component is 60 percent of the map unit.

Cirque basins are formed in volcanic ash influenced loess and glacial till of felsic metamorphic lithology. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep to very deep, weakly developed silt loams and gravelly sandy loams with very cobbly loamy sand substrata. These soils are classified as Andic Cryochrepts and Entic Cryumbrepts. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation is subalpine fir and sedge/shrub complexes. This component is 20 percent of the map unit.

Trough bottoms are formed in mixed volcanic ash influenced loess, glacial till and stratified outwash of felsic metamorphic lithology. Slope gradients range from 1 to 30 percent. Soils on these landforms are deep to very deep, weakly developed silt loams, and gravelly sandy loams with very cobbly loamy sand or sand substrata. These soils are classified as Andic Cryochrepts, Entic Cryumbrepts, and Andic Cryaquepts. The dominant potential natural vegetation is subalpine fir, grand fir and sedge/shrub complexes. This component is 20 percent of the map unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA59-M332A

MOUNTAIN SLOPES AND RIDGES: GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in mountains and canyons of north central Idaho and central Idaho in the Salmon and Clearwater River basins.

Acreage by Section

59-M332A	129,742

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is colluvial mountain slopes. Parent materials are moderately weathered gneiss, schist and quartzite associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams, loams and sandy loams. The vegetation is dominantly coniferous forest, with some grassland at low elevations on south aspects. Mean annual precipitation ranges from 64 to 114 centimeters (25 to 45 inches). The elevation range is 700 to 2000 meters (2300 to 6500 feet). The dominant slopes have gradients of 35 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in volcanic ash influenced loess, residuum and colluvium of felsic lithology. Soils on these landforms are deep to very deep, moderately developed silt loams, loams and sandy loams with sandy or substrata. Soils on low elevations on south aspects are Ultic Haploxerolls. At mid elevations soils are classified as Andic Dystrochrepts and Typic Dystrochrepts, and at high elevations they are Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass, at mid elevations, Douglas-fir and grand fir, and at high elevations - subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA60-M332A

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot Mountain Range of central Idaho in the Upper Salmon and Upper Selway River Basins.

Acreage by Section

60-M332A	63,800

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non glaciated steep mountain slope setting, below the zone of strong frost shattering, which is typically composed of moderately dissected mountain slopes, ridge tops, and narrow valley bottoms. Parent materials are colluvium and residuum underlain by precambrian belt rocks such as argillite, quartzite, and siltite.

Accessory Characteristics: The primary soils are shallow to deep, medium-textured, and have numerous rocks fragments throughout the profile. The vegetation is a mosaic of coniferous forest and native grasslands. Mean annual precipitation ranges from 64 to 89 centimeters (25 to 35 inches). The elevation range is 1463 to 1951 meters (4800 to 6400 feet). The dominant slopes have gradients of 10 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes, and ridge tops.

Mountain slopes are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are shallow to very deep and well drained. Soils are weakly developed in areas underlain by the coarse-textured rock types, such as quartzite, and having cooler forested habitat types. These soils have gravelly fine sandy loam surface layers and extremely cobbly fine sandy loam substrata. Soils that formed in material derived from fine-textured rocks, such as argillite, and having warmer forested or grassland series are well developed. These soils have gravelly loam surface layers and very cobbly sandy clay loam or clay loam substrata. The dominant soils are classified as Typic and Lithic Ustochrepts, Dystric Cryochrepts, Typic Eutroboralfs and Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, grand fir, Idaho fescue and subalpine fir. This component represents 75 percent of this unit.

Mountain ridge tops are formed in residuum. Slope gradients range from 10 to 35 percent. Soils on this landform are shallow to deep and well drained. These soils are similar to those described above for the mountain slopes landscape component. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and Idaho fescue series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA61-M332A

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater and Bitterroot Mountains of Idaho in the upper Selway and Lochsa River Basins.

Acreeage by Section

61-M332A	95,759

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately to highly dissected mountain slopes and ridgetops. Parent materials are a surface layer of Mazama volcanic ash underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep with silt loam to loam and sandy loam surface textures and very gravelly to cobbly loam to sandy loam subsurface layers. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 178cms (25 to 70 inches). The elevation range is 1219 to 2134 meters (4000 to 7000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in granitic colluvium overlain by Mazama volcanic ash. In the southern portions of this Section many slopes, especially those with southerly to westerly aspects, lack a volcanic ash surface layer. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, moderately to highly developed, and consist of silt loam, sandy loam and loam surface textures with gravelly loam to sandy loam subsurface textures. These soils are classified as Andic Dystrochrepts, Typic Dystrochrepts, and Typic Udivitrands. In the southern portion of this Section, soils are colder and drier and have very gravelly to very cobbly loamy sand textured substrata and are classified as Typic Ustochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir in moister climates and is moderately dry to dry Douglas-fir and subalpine fir in the drier climates to the south. This component represents 80 percent of this unit.

Ridgetops are formed in granitic residuum and colluvium overlain by a mixed layer of Mazama volcanic ash. Slope gradients range from 15 to 50 percent. Soils on these landforms are shallow to deep, moderately developed, and consist of silt loam, loam and gravelly sandy loam surface textures with gravelly to cobbly loam or sandy loam subsurface textures. These soils are classified as Andic Dystrochrepts, Typic Dystrochrepts, and Typic Udivitrands. In the southern portions of this Section, the soils have very gravelly or very cobbly loamy sand substrata and are classified as Typic Ustochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is western redcedar, grand fir, and Douglas-fir. The subalpine fir series also occurs in the southern part of this Section. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest, and Ken McBride, Bitterroot National Forest

LTA62-M332A

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater and Bitterroot Mountain Ranges of north central Idaho in the Clearwater and Salmon River basins.

Acreage by Section

62-M332A 129,836

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a nonglaciaded steep mountain slope landscape setting, below the zone of strong frost shattering, and is typically composed of moderately dissected mountain slopes, ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by weakly weathered granitic and gneissic bedrock.

Accessory Characteristics: The primary soils are shallow to very deep, moderately coarse textured, and have numerous rock fragments throughout the profile. The vegetation is a mosaic of coniferous forest, native grasslands, and dry shrublands. Mean annual precipitation ranges from 64 to 114 cms (18 to 45 inches). The elevation range is 860 to 2073 meters (2300 to 6800 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately dissected by streams. Low order streams are parallel and higher order streams are dendritic in pattern. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes and ridge tops.

Mountain slopes are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are shallow to very deep and somewhat excessively drained or well drained. These soils are weakly developed except that on warm, southeast to west-facing slopes, soils have a more developed, clay enriched subsoil. The weakly developed soils consist of gravelly sandy loam surface layers overlying very cobbly sandy loam substrata. The more developed soils have a gravelly sandy loam surface layer that overlies very gravelly or very cobbly sandy clay loam substrata. The dominant soils are classified as Typic and Lithic Ustochrepts; Ultic Haploxerolls; Typic Dystrochrepts; Dystric Cryochrepts; Typic Eutroboralfs, and Lithic Argiborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, Idaho fescue, grand fir and subalpine fir series. This component represents 80 percent of this unit.

Mountain ridge tops are formed in residuum. Slope gradients range from 20 to 35 percent. Soils on this landform are moderately deep to deep and well drained. Soil textures and degree of soil development are similar to those listed above for the mountain slopes landscape position. These soils are Lithic Ustochrepts, Lithic Argiborolls, Andic Dystrochrepts, Andic Cryochrepts, and Dystric Cryochrepts. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, grand fir, subalpine fir, and Idaho fescue series. This component represents 15 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA63-M332A

MOUNTAIN SLOPES AND RIDGES: SCHIST AND GNEISS

Location: This unit is located in the Clearwater Mountains of Idaho in the lower Selway and Lochsa River Basins.

Acreage by Section

63-M332A	96,467

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a surface layer of Mazama volcanic ash underlain by schist and gneiss with high amounts of mica.

Accessory Characteristics: The primary soils are moderately deep to very deep with silt loam to loam surface textures and gravelly loam subsurface layers. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 30 to 50 inches (76 to 127 cms.) The elevation range is 2500 to 6000 feet (762 to 1829 meters). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in schist and gneiss colluvium overlain by Mazama volcanic ash. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir. This component represents 80 percent of this unit.

Ridgetops are formed in gneiss and schist residuum and colluvium overlain by a mixed layer of Mazama volcanic ash. Slope gradients range from 15 to 50 percent. Soils on these landforms are shallow to deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is western redcedar, grand fir, and Douglas-fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA64-M332A

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This unit is located in the Bitterroot Mountain Range of central Idaho in the Selway River Basin.

Acreage by Section

64-M332A	18,316

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated steep mountain slope landscape setting, below the zone of strong frost shattering, which is typically composed of steep mountain slopes, moderately steep ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by volcanic andesites and rhyolites.

Accessory Characteristics: The primary soils are shallow to very deep with loamy textures and numerous rock fragments throughout the profile. The vegetation is a mosaic of coniferous forest and dry native grasslands. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). The elevation range is 1524 to 2012 meters (5000 to 6600 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and moderately steep ridge tops.

Steep mountain slopes are formed in colluvium derived from andesite or rhyolite. Slope gradients range from 30 to 55 percent. Soils on this landform are deep and well drained. These soils mostly are well developed and consist of gravelly loam or sandy loam surface layers overlying very gravelly or very cobbly sandy clay loam substrata. Similar soils are less well developed and generally have very cobbly sandy loam substrata. The dominant soils are classified as Typic Cryoboralfs, Typic Eutroboralfs, and Typic Ustochrepts, and Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, Douglas-fir and Idaho fescue. This component represents 75 percent of this unit.

Mountain ridge tops and associated spur ridges are formed in residuum and colluvium derived from andesite or rhyolite. Slope gradients range from 20 to 30 percent. Soils on this landform are mostly shallow to moderately deep and well drained. These soils are a mix of weakly developed and well developed soils and consist of gravelly loam surface layers overlying very gravelly or very cobbly sandy loam or sandy clay loam substrata. The dominant soils are classified as Lithic Ustochrepts, Typic Cryoboralfs, and Typic Eutroboralfs. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 15 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA70-M332A

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot Mountain Range of central Idaho in the Selway River Basin.

Acreage by Section

70-M332A	1,385

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by Precambrian sedimentary Belt rocks.

Accessory Characteristics: The primary soils are deep with fine sandy loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 114 to 152 centimeters (45 to 60 inches). The elevation range is 2012 to 2378 meters (6600 to 7800 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are also included in this unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes formed in colluvium derived from Belt rocks such as quartzite, argillite, and siltite. A thin layer of volcanic ash overlies this colluvium in most of the area. Slope gradients range from 35 to 50 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly or cobbly loam or silt loam surface layers and very cobbly to extremely cobbly fine sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir and whitebark pine-subalpine fir series. This component represents 60 percent of this unit.

Frost shattered ridge tops formed in residuum and colluvium from quartzite, argillite, and siltite that also has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of cobbly to extremely cobbly loam or silt loam surface layers that overlie extremely cobbly fine sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir and whitebark pine-subalpine fir series. This component represents 30 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA71-M332A

FROST SHATTERED MOUNTAIN RIDGE TOPS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot and Clearwater Mountain Ranges of central Idaho in the Selway and Lochsa River Basins.

Acreage by Section

71-M332A	62,411

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are Mazama volcanic ash over colluvium and residuum underlain by highly weathered granitic rocks.

Accessory Characteristics: The primary soils are moderately deep to deep with loamy to sandy loam surface textures and gravelly loam and sandy subsurface textures. There are numerous pea-sized and cobble-sized rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 76 to 152 cms. (30 to 60 inches). The elevation range is 1372 to 2500 meters (4500 to 8200 feet). The dominant slopes have gradients of 10 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a layer of wind deposited volcanic ash that overlies colluvium derived from highly weathered granitic rocks. Slope gradients range from 30 to 55 percent. Soils on this landform are deep and somewhat excessively drained. These soils are weakly developed and consist of gravelly sandy loam, loam or silt loam surface layers and very gravelly loamy sand or coarse sandy loam substrata. The dominant soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Haplocryands.. Bedrock is highly weathered granitics (grus). Rock outcrop varies from less than 5 percent of this landscape component in the eastern part of the area to around 10 percent in the western part. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 70 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from highly weathered granitic rocks overlain by volcanic ash loess. Slope gradients range from 10 to 40 percent. Soils on this landform are deep and somewhat excessively drained. These soils are poorly developed and consist of gravelly loam, sandy loam, or silt loam surface layers that overlie very gravelly loamy sand or coarse sandy loam substrata. The dominant soils are classified as Andic Cryochrepts, Dystric Cryochrepts and Typic Cryochrepts. Bedrock is highly weathered granitics. Rock outcrop occurs on less than 5 percent of this landscape component in the eastern areas and up to 20 percent in the west. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 25 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest, and Jim Mital, Clearwater National Forest

LTA72-M332A

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater and Bitterroot Mountain Ranges of central Idaho in the Clearwater and Salmon River basins.

Acreage by Section

72-M332A	177,263

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost-churned ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by weakly weathered granitic rocks.

Accessory Characteristics: The primary soils are deep with silt loam to sandy loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 76 to 140 cms (30 to 55 inches). The elevation range is 5300 to 8300 feet (1600 to 2530 meters). The dominant slopes have gradients of 15 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel, but grading to weakly dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included in this map unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind deposited volcanic ash that overlies colluvium derived from weakly weathered granitic rocks. Slope gradients range from 35 to 50 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly loam or silt loam surface layers and very gravelly or very cobbly sandy loam to sand substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation at mid elevations is grand fir and at higher elevations is subalpine fir and subalpine fir-whitebark pine. This component represents 75 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from weakly weathered granitic rocks that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 15 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of gravelly loam or silt loam surface layers that overlie very gravelly or very cobbly sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation at mid elevations is grand fir and at higher elevations is subalpine fir and whitebark pine-subalpine fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA73-M332A

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This unit is located in the Clearwater Mountains of north central Idaho in the Salmon River Basin.

Acreage by Section

73-M332A	4,171

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by weakly weathered volcanic rocks, typically basalt.

Accessory Characteristics: The primary soils are deep with loam textures that have numerous rock fragments in the profile. The vegetation is coniferous forest. Mean annual precipitation ranges from 89 to 102 centimeters (35 to 40 inches). The elevation range is 1650 to 2000 meters (5500 to 6700 feet). The dominant slopes have gradients of 10 to 30 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered mountain ridge tops.

Frost shattered ridge tops are formed in residuum and colluvium derived from weakly weathered basalt that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and well drained. These soils are moderately developed and consist of gravelly loam or silt loam surface layers that overlie very gravelly or very cobbly loam or clay loam substrata. The dominant soils are classified as Andeptic Cryoboralfs. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is grand fir and subalpine fir series. This component represents 85 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA77-M332A

FROST SHATTERED MOUNTAIN RIDGE TOPS: GNEISSES, QUARTZITES, AND SCHISTS

Location: This unit is located on ridges in north central and central Idaho in the Clearwater, Snake, and Salmon River basins.

Acreage by Section

77-M332A	159,797

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is convex frost shattered ridges and sideslopes. Soils form in volcanic ash influenced loess and poorly to moderately weathered gneiss, schist, and quartzite associated with the Idaho Batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams and sandy loams. The vegetation is coniferous forest and openings dominated by herbaceous plant communities. Mean annual precipitation ranges from 89 to 127 centimeters (35 to 50 inches). The elevation range is 160 to 2300 meters (5200 to 7500 feet). The dominant slopes have gradients of 20 to 50 percent. This unit is poorly to moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a significant component of this unit.

LTA Components: This landtype association consists of convex ridges and sideslopes.

Frost shattered convex ridges and slopes are formed in volcanic ash influenced loess and residuum of felsic metamorphic lithology. Soils on these landforms are deep to very deep, poorly developed silt loams or loams with very gravelly or cobbly loamy sand substrata. These soils are classified as Andic Cryochrepts, Vitric Haplocryands and Vitric Fulvicryands. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir, and at high elevations subalpine fir and whitebark pine/subalpine fir series.

Compiled by: Pat Green, Nez Perce National Forest

LTA80-M332A

LOW RELIEF HILLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Clearwater Mountains of Idaho in the upper Lochsa River Basin.

Acreage by Section

80-M332A	1,243

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a mid elevation, gentle to moderately sloping, mountain sideslope and ridge landscape setting, which is composed of highly dissected mountain slopes and associated ridges comprised deeply weathered residuum. Parent materials are surface volcanic ash overlying moderately to highly weathered quartzites, and siltites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep silt loams and loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 89 to 127 centimeters (35 to 50 inches). The elevation range of this unit is 1068 to 1373 meters (3500 to 4500 feet). The dominant slopes have gradients of 10 to 30 percent. This unit is highly dissected by streams, with the stream pattern being strongly dendritic. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills with gentle to moderately steep slopes and are formed in metasediments that consist of quartzites, siltites and inclusions of schists overlain by Mazama volcanic ash. The slope gradients range from 10 to 40 percent. Soils on these landforms are deep, moderately to highly weathered and medium textured. The major soils on the well drained sites are classified as Vitric Hapludands, Typic Udivitrands, and Alfic Udivitrands. The dominant potential natural vegetation on the well drained sites are western redcedar and grand fir. This component represents 90 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest and Jerry Niehoff, Idaho Panhandle National Forests

LTA81-M332A

LOW RELIEF HILLS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot Mountain Range of central Idaho in the Selway River Basin.

Acreage by Section

81-M332A	139,140

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately steep, highly dissected mountain slope landscape setting which is typically composed of dissected slopes, ridge tops, and noses of spur ridges. Parent materials are colluvium and residuum underlain by highly weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with loamy sand to sandy clay loam textures and have numerous rock fragments throughout the profile. The vegetation is a mosaic of dry shrublands, grasslands, and coniferous forest. Mean annual precipitation ranges from 64 to 102cms (25 to 40 inches). The elevation range is 1097 to 1890 meters (3600 to 6200 feet). The dominant slopes have gradients of 10 to 45 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected mountain slopes, and ridge tops.

Dissected mountain slopes are formed in colluvium derived from highly weathered granitics. Slope gradients range from 25 to 45 percent. Soils on this landform are moderately deep to deep and somewhat excessively to well drained. These soils are poorly developed to well developed and consist of gravelly sandy loam surface layer that overlies very gravelly to very cobbly loamy sand or sandy clay loam substrata. The dominant soils are classified as Dystric Cryochrepts, Typic Ustochrepts, and Typic Eutroboralfs. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 60 percent of this unit.

Ridge tops and associated noses of spur ridges are formed in residuum and colluvium derived from highly weathered granitics. Slope gradients range from 10 to 25 percent. Soils on this landform are shallow to moderately deep and somewhat excessively drained. These soils are poorly developed to well developed and consist of gravelly or very gravelly sandy loam or loam surface layers over very gravelly or very cobbly loamy sand or sandy clay loam substrata. The dominant soils are classified as Lithic Argiborolls, Typic Eutroboralfs, Typic Ustochrepts, and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, Douglas-fir, and subalpine fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA82-M332A

LOW RELIEF HILLS: VOLCANICS

Location: This unit is located on isolated plateaus and broad ridgetops above granitic slopes and canyonlands in west central Idaho.

Acreage by Section

82-M332A	26,996

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is usually isolated plateaus developed primarily in loess and moderately weathered residuum of Columbia River basalt, in a landscape dominated by granitic lithology.

Accessory Characteristics: The primary soils are deep to very deep silt loams and loams. The vegetation is dominantly coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range is 1070 to 1800 meters (3500 to 5900 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is slightly to moderately dissected by streams with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of plateaus.

Plateaus are formed in loess and residuum of volcanic lithology. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, moderately developed silt loams with clay or silty clay substrata. These soils are classified as Ultic Argixerolls and Andeptic Cryoboralfs. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation is Douglas-fir and grand fir series. Western red cedar is dominant in the north part of the Clearwater basin.

Compiled by: Pat Green, Nez Perce National Forest

LTA83-M332A

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This unit is located in west-central Idaho in the South Fork of the Clearwater River Basin.

Acreage by Section

83-M332A	27,852

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are Mazama volcanic ash and wind-blown loess underlain by Tertiary alluvial deposits.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 102 cms. (25 to 40 inches). The elevation range is 762 to 1524 meters (2500 to 5000 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in Tertiary alluvium overlain by Mazama volcanic ash and wind-blown loess. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam to silty clay subsurface textures. These soils are classified as Ultic Haploxeralfs, Typic Eutroboralfs, and Andic Argixerolls. Rock outcrops are uncommon on this landscape component. The dominant potential natural vegetation is grand fir and Douglas-fir.

Compiled by: Jim Mital, Clearwater National Forest

LTA84-M332A

LOW RELIEF HILLS: HIGHLY WEATHERED SCHISTS

Location: This unit is located at middle elevations in north central Idaho in the Clearwater River basin.

Acreage by Section

84-M332A	20,976

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is rolling uplands developed in volcanic ash influenced loess and highly weathered residuum of Precambrian schist.

Accessory Characteristics: The primary soils are very deep silt loams. The vegetation is dominantly coniferous forest. Mean annual precipitation ranges from 97 to 127 centimeters (38 to 50 inches). The elevation range is 1000 to 1800 meters (3000 to 5900 feet). The dominant slopes have gradients of 20 to 50 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists of rolling hills.

Rolling hills are formed in volcanic ash influenced loess and schist residuum. Soils on these landforms are very deep, moderately developed silt loams with gravelly sandy loam substrata. These soils are classified as Typic Udivitrands. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation is western red cedar and grand fir, with Sitka alder communities in moist openings.

Compiled by: Pat Green, Nez Perce National Forest

LTA85-M332A

LOW RELIEF HILLS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located at middle elevations in north central Idaho in the Salmon River and Clearwater River basins.

Acreage by Section

85-M332A	180,023

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is rolling uplands developed in volcanic ash influenced loess and moderately weathered residuum of gneiss, schist, and quartzite associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams. The vegetation is dominantly coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range is 750 to 2000 meters (2500 to 6600 feet). The dominant slopes have gradients of 20 to 50 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists of rolling hills.

Rolling hills are formed in volcanic ash influenced loess and quartzite, gneiss, and schist residuum. Soils on these landforms are very deep, moderately developed silt loams with gravelly sandy loam substrata. These soils are classified as Andic Dystrochrepts. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir series, and at upper elevations subalpine fir series. Western red cedar and alder communities in moist openings are common near the north part of the Clearwater River basin.

Compiled by: Pat Green, Nez Perce National Forest

LTA90-M332A

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in west-central Idaho in the South Fork Clearwater River and Selway River Basins.

Acreage by Section

90-M332A	29,413

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is mass wasted slopes. Parent materials are can be of any lithology, but in this Section they are dominantly volcanics (Columbia flood basalts) and gneisses and schists overlain with a variable thickness of Mazama volcanic ash.

Accessory Characteristics: The primary soils are deep to very deep silt loams to cobbly loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 51 to 102 cms (20 to 40 inches). The elevation range is 610 to 1524 meters (2000 to 5000 feet). The dominant slopes have gradients of 30 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel to dendritic. Wetlands are a minor component of this unit, but moist seeps can be locally common.

LTA Components: This landtype association consists of mass wasted slopes.

Mass wasted slopes are formed in mixed Mazama volcanic ash overlying Columbia River flood basalts and gneisses and schists. Slope gradients range from 30 to 80 percent. Soils on these landforms are deep to very deep, weakly to moderately developed loams to cobbly loams, sometimes with a clayey substrata. These soils are classified as Dystric Xerochrepts, Typic Dystrochrepts, and Vitrandic Dystrochrepts. Rock outcrops occurs on less than 10 percent of this unit. The dominant potential natural vegetation is ponderosa pine, Douglas-fir, and grand fir.

Compiled by: Jim Mital, Clearwater National Forest

CHAPTER 6

LTA Descriptions

Section M332B Bitterroot Valley

This Section occurs in west central Montana. It is a portion of the Southwest Montana Mountain and Valley area previously described. Forty eight LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. Map unit descriptions are preceded by the following illustrations:

Figure 20: Map showing location of M332B within the Northern Region

Figure 21: M332B landscape photograph
Bitterroot National Forest

Figure 22: Map showing distribution of LTAS within M332B

Figure 23: Bar chart showing abundance of landform groups within M332B

Figure 24: Bar chart showing abundance of geologic material groups within M332B

LTA10-M332Bd

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the Sapphire Mountains, Flint Range, and the Pintler Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin in southwest Montana.

Acreage by Subsection

10-M332Bd 27,680

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a valley bottom landscape setting, which is typically composed of floodplains and terraces. Parent material is alluvium deposited over a variety of bedrock types.

Accessory Characteristics: The primary soils are deep with cobbly sandy and loamy textures. The vegetation is a mosaic of grasslands, shrublands, and coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 1524 to 1829 meters (5000 to 6000 feet). The dominant slopes have gradients of 0 to 20 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being parallel. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of floodplains and terraces.

Floodplains are formed in coarse alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, weakly developed, with cobbly sandy and loamy textures. These soils are classified as Typic Cryaquepts and Cryaquolls, and Typic and Oxyaquic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 40 percent of this LTA.

Terraces are formed in coarse alluvium. Slope gradients range from 0 to 20 percent. Soils on these landforms are deep, weakly developed, with cobbly sandy and loamy textures. These soils are classified as Typic Cryoboralfs, Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 60 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA10-M332B

VALLEYS: RECENT COARSE ALLUVIUM

Location: This unit is located in the major valley bottoms of west-central Montana and is in the Bitterroot, Blackfoot, and Upper Clark Fork River Basins.

Acreage by Section

10-M332B 174,283 (Section except M332Bd)

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a major valley bottom landscape setting which is typically composed of floodplains, terraces, and alluvial basins. Parent materials are recent alluvial deposits and older outwash deposits.

Accessory Characteristics: The primary soils are very deep with coarse to medium textures. The vegetation is a mosaic of dry coniferous forest, riparian deciduous forest, and wet meadows. Mean annual precipitation ranges from 28 to 46 centimeters (11 to 18 inches). The elevation range is 975 to 1677 meters (3200 to 5500 feet). The dominant slopes gradients are 0 to 6 percent. This unit is moderately dissected by streams; the dominant stream pattern is dendritic. Wetlands are a major component of this unit.

LTA Components: This landtype association consists of stream terraces, floodplains, and alluvial basins.

Stream terraces are formed in mixed alluvium and glacial outwash. Slope gradients range from 2 to 6 percent. Soils on this landform are very deep and somewhat excessively to somewhat poorly drained. These soils are weakly developed and consist of thin layer of loamy material over sand and gravel to cobble-sized rocks. The dominant soils are classified as Fluvaquentic Haploborolls and Typic Ustorthents. Rock outcrops do not occur in this landscape component. The dominant potential natural vegetation is ponderosa pine series. This component represents about 40 percent of this unit.

Floodplains are formed in extremely gravelly and cobbly, recent alluvium. Slope gradients range from 1 to 3 percent. Soils on this landform are very deep and poorly drained. These soils are weakly developed and consist mostly of cobbles, gravels and sands. The dominant soils are classified as Typic Fluvaquents. Rock outcrop does not occur on this landscape component. Areas of cobbly to gravelly riverwash make up about 10 percent of this unit. The dominant vegetation is a black cottonwood community type. The potential natural vegetation is not certain. This component represents about 35 percent of this unit.

Alluvial basins are formed in medium textured recent alluvium. Slope gradients range from 0 to 2 percent. Soils on this landform are very deep and very poorly drained. These soils are weakly developed and consist of several feet of loamy and mucky alluvium over coarser sands and gravels. These soils are classified as Fluvaquentic Endoaquolls. Rock outcrop does not occur on this landform. The dominant potential natural vegetation is a complex of common cattail and water sedge plant associations and Nebraska sedge community type. Mountain alder community type occupies many areas of this component. This component represents 25 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA11-M332B

VALLEYS: LACUSTRINE DEPOSITS

Location: This unit is located primarily in the Upper Clark Fork River Basin of northwestern Montana.

Acreage by Section

11-M332B	117,468

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley terrace landscape setting, which is typically composed of Glacial Lake Missoula lacustrine deposits on terraces and benches that have slightly undulating surfaces. Parent materials consist of stratified lacustrine deposits of very fine sand, silt and clay materials underlain by alluvial valley materials.

Accessory Characteristics: The primary soils are deep, layered, very fine sand, silt and clay textured. Historically the vegetation was a continuous cover of open grown coniferous forest. Today home developments and farmland cover many of the acres of this LTA. Mean annual precipitation ranges from 33 to 51 centimeters (13 to 20 inches). The elevation range of this LTA is 616 to 1354 meters (2000 to 4400 feet). The dominant slopes have gradients of 0 to 25 percent except along incised draws. This unit is slightly dissected by streams, where present, with the dominant stream pattern being dendritic. These are very dry landscapes and typically do not contain wetland features.

LTA Components: This landtype association consists of lacustrine terraces.

Lacustrine terraces are formed in fine stratified materials. These terraces have slope gradients ranging from 0 to 25 percent. Soils on these landforms are deep, poorly developed and consist mostly of very fine sand, silt and clay. The major soils are classified as Typic Eutroboralfs. Rock outcrop occurs on less than 2 percent of this landscape component except as the lacustrine material was deposited around scoured landscapes. The dominant potential natural vegetation is the Douglas-fir series.

Compiled by: Skip Barndt, Lolo National Forest

LTA12-M332B

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIUM

Location: This unit is located in the major river valleys of west-central Montana which includes the Bitterroot, Blackfoot, and Upper Clark Fork River basins.

Acreage by Section

12-M332B	292,138

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a major river valley setting which is typically composed of coalescing glacial outwash fans and stream terraces and of lesser amounts of associated glacial moraines. Parent materials are coarse glacial outwash deposits that have high amounts of cobble, gravel overlain by finer alluvium and coarse, bouldery glacial till.

Accessory Characteristics: The primary soils are very deep with coarse textures and numerous rock fragments. The vegetation is a mosaic of coniferous forest, savannahs, and dry grassland. Mean annual precipitation ranges from 28 to 51 centimeters (11 to 20 inches). The elevation range is 914 to 1585 meters (3000 to 5200 feet). The dominant slopes have gradients of 2 to 30 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel on fans and terraces and deranged on rolling moraines. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of coalescing fans and terraces, and rolling glacial moraines.

Coalescing fans and terraces are formed in coarse glacial outwash that is overlain by a thin layer of medium textured alluvium. Slope gradients range from 2 to 20 percent. Soils on this landform are very deep and somewhat excessively drained. These soils are weakly developed and consist of dark, gravelly loam about 15 inches thick overlying extremely cobbly sand outwash. The dominant soils are classified as Typic Haploborolls and Aridic Ustochrepts. Rock outcrop does not occur in this landscape component. The dominant potential natural vegetation is a complex of ponderosa pine, rough fescue and Douglas-fir series. This component represents 70 percent of this unit.

Glacial moraines are formed in coarse, stony to bouldery glacial till. Slope gradients range from 5 to 30 percent. Soils on this landform are very deep and somewhat excessively drained. These soils are weakly developed and consist of extremely bouldery sandy loam surface layers overlying extremely cobbly loamy sand substrata. The dominant soils are classified as Typic Ustochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA14-M332B

VALLEYS: RECENT FINE ALLUVIUM

Location: This unit is located in the Sapphire Mountain Range of west-central Montana and is in the Bitterroot River Basin.

Acreage by Section

14-M332B	33,479

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a major valley bottom landscape setting which is typically composed of floodplains, stream terraces, and alluvial basins. Parent materials are recent alluvial deposits.

Accessory Characteristics: The primary soils are very deep with moderately fine to fine textures. The vegetation is a mosaic of dry coniferous forest, riparian deciduous forest, and wet meadows. Mean annual precipitation ranges from 46 to 61 centimeters (18 to 24 inches). The elevation range is 1341 to 1524 (4400 to 5000 feet). The dominant slopes have gradients of 0 to 8 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this unit.

LTA Components: This landtype association consists of alluvial basins, stream terraces, and floodplains.

Alluvial basins are formed in moderately fine textured recent alluvium. Slope gradients range from 0 to 3 percent. Soils on this landform are very deep and poorly or very poorly drained. These soils are weakly developed and consist of several feet of moderately fine and mucky alluvium over coarser sands and gravels. The dominant soils are classified as Cumulic Cryaquolls and Histic Cryaquolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is a common cattail and water sedge plant associations and Nebraska sedge community type. This component represents about 35 percent of this unit.

Stream terraces are formed in mixed alluvium and glacial outwash. Slope gradients range from 2 to 8 percent. Soils on this landform are very deep and somewhat poorly to well drained. These soils are weakly developed and consist of several feet of medium to moderately fine sediment over sands and gravels. The dominant soils are classified as Oxyaquic Cryoborolls, and Cumulic Cryoborolls. Rock outcrop does not occur on this component. The vegetation on this component has all been converted to hay meadows and the potential natural vegetation is uncertain. This component represents about 30 percent of this unit.

Floodplains are formed in extremely gravelly and cobbly, recent alluvium. Slope gradients range from 1 to 4 percent. Soils on this landform are very deep and poorly drained. These soils are weakly developed and consist of cobbles, gravels, and sands. The dominant soils are classified as Typic Cryaquents. Areas of cobbly to gravelly riverwash also occur within this component. Rock outcrop does not occur on this component. The dominant vegetation is a black cottonwood community type. The potential natural vegetation is uncertain. This component represents about 20 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA20-M332B

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the Sapphire and Bitterroot Mountains of west-central Montana and occurs in the Bitterroot, Blackfoot, and upper Clark Fork River Basins.

Acreage by Section

20-M332B	360,304

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded or faulted landscape setting which is typically composed of structural or stream breaks. Parent material is colluvium and residuum derived from metamorphosed Precambrian sedimentary bedrock and from small areas of volcanic bedrock (mostly rhyolite and andesite).

Accessory Characteristics: The primary soils are shallow to very deep with very gravelly to very cobbly medium textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 46 to 102 centimeters (18 to 40 inches). The elevation range is 1219 to 2134 meters (4000 to 7000 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this unit. Wide valley bottoms occur at the base of this unit, but are generally considered as map unit inclusions.

LTA Components: This landtype association consists of structural and stream breaks:

These landforms are formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to very deep and well drained. These soils are weakly developed, and consist of very gravelly sandy loam surfaces overlying extremely gravelly sandy loam substrata. The dominant soils are classified as: Dystric and Lithic Cryochrepts, and Typic and Lithic Ustochrepts. Rock outcrop and talus occupy about 15 percent of this landscape. On cool, mesic sites the dominant potential natural vegetation is subalpine fir series. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. Stream and/or structural breaklands represent about 85 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA21-M332B

BREAKS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the southern end of the Bitterroot Mountains and occurs in the Bitterroot River Basin of west-central Montana.

Acreage by Section

21-M332B	18,000

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded landscape setting which is typically composed of stream breaks. Parent material is colluvium and residuum derived from highly weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep, with very gravelly to extremely gravelly coarse, sandy textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is 1280 to 2073 meters (4200 to 6800 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Talus and areas of rock outcrop are major components of this map unit. Wetlands are a minor component of this unit. Wide valley bottoms occur in this unit but are generally considered map unit inclusions.

LTA Components: This landtype association consists of stream breaks.

These landforms formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to very deep and somewhat excessively drained. These soils are weakly developed and consist of very gravelly sandy loam surfaces overlying extremely gravelly loamy coarse sand substrata. The dominant soils are classified as: Dystric and Lithic Cryochrepts, and Typic and Lithic Ustochrepts. Rock outcrop and talus occupy about 20 percent of this unit. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. On cool, mesic sites the dominant potential natural vegetation is subalpine fir series. Stream breaklands represent about 85 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA22-M332B

BREAKS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the lower Bitterroot Mountains which is in the Upper Clark Fork River Basin of northwest Montana.

Acreage by Section

22-M332B	59,119

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on mountain sideslope landscape settings, which are composed of structural or stream breaks. Parent materials are weakly weathered granitics. The landscape is dotted with granitic tors, towers and rock outcrops due to the hardness of the material.

Accessory Characteristics: The primary soils are shallow extremely gravelly sandy loams. The vegetation is a mosaic of coniferous forest and scree. Mean annual precipitation ranges from 76 to 190 centimeters (30 to 75 inches). The elevation range of this LTA is 985 to 2031 meters (3200 to 6600 feet). The dominant slopes have gradients are greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Talus, tors, towers, and rock outcrops are major components of this map unit.

LTA Components: This landtype association consists of structural and stream break components.

These landforms are developing on the steep mountain slopes adjacent to drainage bottoms. The slope gradients range from 50 to 100 percent. Soils on these landforms are shallow with minimal development. The major soils are classified as Dystric Eutrochrepts and Andic Cryochrepts. Rock outcrops occupy less than 15 to over 50 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir series.

Compiled by: Skip Barndt, Lolo National Forest.

LTA24-M332B

BREAKS: VOLCANICS

Location: This unit is located in the Sapphire and Bitterroot Mountains and occurs within the Bitterroot River Basin of west-central Montana.

Acreage by Section

24-M332B	14,377

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded or faulted landscape setting which is typically composed of structural and stream breaks. Parent material is colluvium and residuum derived from volcanic bedrock (mostly rhyolite and andesite).

Accessory Characteristics: The primary soils are shallow to very deep with very gravelly medium to moderately fine textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 46 to 76 cms. (18 to 30 inches). The elevation range is 1219 to 2012 meters (4000 to 6600 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Combined, rock outcrop and talus are major components of this map unit. Wetlands are a minor component of this unit. Wide valley bottoms occur in this unit, but are generally considered only map unit inclusions.

LTA Components: This map unit consists of structural and stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to very deep and well drained. These soils are weakly to moderately weathered, and consist of gravelly loam surfaces overlying very gravelly clay loam or very gravelly loam substrata. The dominant soils are classified as: Typic Ustochrepts, Typic Eutroboralfs, Lithic Argiborolls, and Dystric and Lithic Cryochrepts. Rock outcrop and talus occupy about 15 percent of this map unit. On cool, mesic sites the dominant potential natural vegetation is subalpine fir series. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. Stream and structural breaklands represent about 85 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA25-M332B

BREAKS: SANDSTONES AND SHALES

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin in southwest Montana.

Acreage by Section

25-M332B	13,741

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream breaks. Parent materials are residuum underlain by sandstone, shale and other mixed sedimentary bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 41 to 51 centimeters (16 to 20 inches). The elevation range of this LTA is 1463 to 1982 meters (4800 to 6500 feet). The dominant slopes have gradients of 60 to 100 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream breaks.

Stream breaks are formed in very steep, stream dissected sandstone, shale, and other mixed sedimentary bedrock. Slope gradients range from 45 to 75 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Lithic and Typic Cryochrepts and Cryorthents, and includes some Lithic and Typic Cryoboralfs. Rock outcrop occurs on 10 to 30 percent of this landscape component, depending on rock type. The dominant potential natural vegetation is the Douglas-fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA27-M332B

BREAKS: CARBONATES

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin in southwest Montana.

Acreage by Section

27-M332B	9,864

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream breaks. Parent materials are residuum underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 41 to 51 centimeters (16 to 20 inches). The elevation range of this LTA is 1524 to 1982 meters (5000 to 6500 feet). The dominant slopes have gradients of 45 to 80 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being trellis. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream breaks.

Stream breaks are formed in very steep, stream dissected limestone bedrock. Slope gradients range from 45 to 75 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Lithic and Typic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA29-M332B

BREAKS: QUARTZITES AND CALC-SILICATES

Location: This unit is located in the Sapphire Mountains and occurs in the Bitterroot River Basin of west-central Montana.

Acreage by Section

29-M332B	5,637

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded landscape setting which is typically composed of stream breaks. Parent material is colluvium and residuum derived from weakly weathered quartzite and calc-silicates of the Belt Supergroup.

Accessory Characteristics: The primary soils are shallow to deep with very gravelly, very cobbly or extremely cobbly coarse to medium textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 46 to 89 cms. (18 to 35 inches). The elevation range is 1219 to 2134 meters (4000 to 7000 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Rock outcrop, talus, and scree combined, are major components of this map unit. Wetlands are a minor component of this unit. Relatively wide valley bottoms occur in this unit, but are generally considered only map unit inclusions.

LTA Components: This landtype association consists of stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to deep and well drained. These soils are weakly to moderately developed, and consist of very cobbly loam surfaces overlying extremely cobbly fine sandy loam substrata. The dominant soils are classified as: Typic and Lithic Ustochrepts, Typic Eutroboralfs, Lithic Argiborolls, plus Dystric and Lithic Cryochrepts, Rock outcrop, talus and scree occupy about 25 percent of this map unit. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. On cool, mesic sites the dominant potential natural vegetation is subalpine fir series. Stream breaklands represent about 85 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA34-M332B

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Blackfoot River drainage.

Acreage by Section

34-M332B 46,982

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting which is typically composed of steep mountain slopes. Parent material is colluvium and residuum underlain by weakly weathered andesite and other volcanic rocks. In some areas the parent material is influenced by a complex of volcanic and metasedimentary Belt Series rocks.

Accessory Characteristics: The primary soils are moderately deep or deeper and are medium to moderately fine textured. The vegetation is coniferous forest. Mean annual precipitation ranges from 50 to 75 centimeters (20 to 30 inches). The elevation range of this LTA is 1464 to 2135 meters (4800 to 7000 feet). The dominant slopes have gradients of 25 to 60 percent. This LTA is moderately dissected (moderately to widely spaced drainages) and deeply incised by streams with the dominant stream pattern being dendritic. Small wetlands are sometimes associated with slumpy areas.

LTA Components: This landtype association consists of high relief mountain slopes.

High relief mountain slopes are mostly formed in andesite and other volcanic rock. In some areas they are influenced by a complex of volcanic and metasedimentary Belt Series rocks. Slope gradients range from 25 to 60 percent. Soils on these landforms are moderately deep to very deep, moderately developed, and have very gravelly or gravelly loam, cobbly loam and stony loam surfaces. Subsurface textures include very and extremely stony clay loam, very and extremely cobbly loams, very gravelly clay loam and extremely gravelly loam. These soils are classified as Typic Cryoboralfs, Typic Eutroboralfs, and Typic Argiborolls. Rock outcrop occurs on less than 5 percent of this landscape component. Small landslides are associated with basaltic and andesitic dikes and sills or local ash/tuff deposits. The dominant potential natural vegetation series are Douglas-fir and subalpine fir. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA35-M332B

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES: CALC-SILICATES AND QUARTZITES

Location: This unit is located in the Bitterroot and Sapphire mountain ranges of western Montana in the Bitterroot and Upper Clark Fork River Basins

Acreage by Section

35-M332B 27,909

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation broad ridgetop position which is typically composed of weakly expressed glaciated slopes and basins that were formed by ice-cap glaciers, minor valley glaciers, and periglacial frost shattering. Parent materials are a complex of frost shattered residuum and colluvium intermixed with glacial till derived from Precambrian calc-silicate and quartzitic rocks.

Accessory Characteristics: The primary soils are shallow to deep, medium textured soils with numerous rock fragments and have a volcanic ash surface layer. The vegetation is a mosaic of coniferous forest, stunted wind-deformed forest, and occasional small wet meadows. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 1951 to 2683 meters (6500 to 8800 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of weakly developed glacial cirques, and frost shattered mountain ridge tops.

Weakly developed glacial cirques are formed in residuum, colluvium, and till. Slope gradients range from 20 to 55 percent. Soils on this landform are shallow to deep and well drained. These soils are weakly developed and consist of extremely bouldery loam volcanic ash surface layers overlying very stony sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs in about 10 percent of this landscape component. The dominant potential natural vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir series. This component represents 65 percent of this unit.

Frost shattered mountain ridge tops are formed in residuum and colluvium. Slope gradients range from 20 to 50 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of very stony loam volcanic ash surface layers overlying very cobbly coarse sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, alpine larch-subalpine fir, and subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA37-M332B

HIGH RELIEF MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located in the Alice/Nevada Mountains within the Clark Fork basin.

Acreage by Section

37-M332B 6,635

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting which is typically composed of mountain slopes and narrow ridges. Parent materials are colluvium and residuum underlain by limestones and calcareous argillite.

Accessory Characteristics: The primary soils are moderately deep and shallow with extremely limey and rocky subsurface layers. The vegetation is a mosaic of coniferous forest with scattered grasslands and shrublands. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1739 to 2288 meters (5700 to 7500 feet). The dominant slopes have gradients of 40 to 60 percent. This LTA is moderately to slightly (moderately to widely spaced) dissected and weakly incised by streams, with the dominant stream patterns being subparallel and dendritic.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in limestone or calcareous argillite colluvium and residuum. Slope gradients range from 40 to 60 percent. Soils on these landforms are mostly moderately deep and shallow, weakly developed and are loamy. These soils are classified as Typic and Lithic Ustochrepts, and Typic and Lithic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir series. Subalpine fir series dominates on northerly aspects.

Compiled by: Larry Laing, Helena National Forest

LTA40-M332B

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the Lower Bitterroot Garnet, Sapphire and Swan Mountains of the Upper Clark Fork River basin of northwest Montana.

Acreage by Section

40-M332B	401,649

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a steep, alpine glacial landscape setting. Parent materials are metasediments composed of argillites, siltites and quartzites with alpine glacial till scattered throughout; which is typically, medium textures.

Accessory Characteristics: The primary soils are shallow to moderately deep moderately coarse to medium textured. The vegetation is a mosaic of coniferous forest, avalanche chutes, and rock outcrops. Mean annual precipitation ranges from 102 to 254 centimeters (40 to 100 inches). The elevation range of this unit is 1785 to 2923 meters (5800 to 9500 feet). The dominant slopes have gradients greater than 60 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wet sidehill areas and grassy parks are a major component of this unit.

LTA Components: This landtype association consists of steep, glaciated mountain slopes, and narrow valley trains.

Steep, glaciated mountain slopes are formed in metasediments that consist of argillites, siltites and quartzites. Glacial trough walls, headwalls and ridge systems are formed in the underlying bedrock. The convex uplands and side slopes have been strongly scoured and contain shallow soils. The lower slopes have glacial till accumulations. These areas have slopes that range from 45 to 100 percent. Soils on the upper part of the landform are shallow to moderately deep residuals and consist of rock and medium textured materials. The lower portion of the landform has deep soils, formed in the glacial till material. The major soils are classified as Cryandepts, Entic Cryandepts, and Andic Cryochrepts. Rock outcrops occupy more than 40 percent of the area. The dominant potential natural vegetation is subalpine fir. This landform component makes up 80 percent of the unit.

The narrow valley train glacial till is developed on valley bottoms landforms. Slope gradients range from 5 to 35 percent. Soils on these landforms are deep, moderately developed and consist mostly of loamy glacial till. The major soils are classified as Entic Cryandepts. The dominant potential natural vegetation is subalpine fir. This landform component represents 20 percent of the unit.

Compiled by: Skip Barndt, Lolo National Forest

LTA41-M332B

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Bitterroot and Anaconda Mountain Ranges of west-central Montana in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

41-M332B	338,618

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on steep and very steep alpine glacial landscape settings. Parent material is colluvium, residuum, and scattered alpine glacial till, derived from granitic sources.

Accessory Characteristics: The primary soils are shallow to deep, coarse textured, and contain numerous rock fragments throughout the profile. Additionally, avalanche chutes, rock outcrop, and rubbleland are major components to this map unit. The vegetation is a mosaic of closed to open coniferous forest, and moist shrublands. Mean annual precipitation ranges from 46 to 254 cms. (18 to 100 inches). The elevation range is 1219 to 3110 meters (4000 to 10200 feet). The dominant slopes have gradients of 15 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands (wetside hills and avalanche chutes), lakes, and ponds are major components of this unit.

LTA Components: This landtype association consists of glacial trough walls, alpine ridges, and cirques (headwalls and basins).

Glacial trough walls were formed by alpine glacial scouring. After the glaciers retreated the walls were further modified by landslides and avalanches creating avalanche chutes. Slope gradients range from 50 to 100 percent and slope shape is straight to concave. Soils on this landform are shallow to deep and very poorly to somewhat excessively drained. These soils are weakly developed, and consist of very cobbly loam surfaces overlying very cobbly loamy sand or very cobbly sandy loam substrata. The dominant soils are classified as: Lithic Cryochrepts, Andic Cryochrepts, Lithic Ustochrepts, and Typic Ustochrepts. Typic Cryaquands occur extensively on northerly aspects in the headwaters portion of these troughs. Rock outcrop, rubbleland, and avalanche chutes occupy about 45 percent of this component. The most common potential natural vegetation is subalpine fir, alpine larch-subalpine fir, and Douglas-fir. Avalanche chutes have a sitka alder community type. The Typic Cryaquands soils that occur in the headwater portions of trough walls support a sitka alder habitat type. This landform component represents about 60 percent of this unit.

Cirque headwalls and basins were formed by alpine glacial erosion. Cirque basins have slope gradients of 15 to 50 percent. Cirque headwalls have slope gradients greater than 60 percent (approaching vertical). Soils on this landform are shallow to very deep, and very poorly drained to well drained. These soils are weakly developed and consist of very cobbly or extremely bouldery silt loam volcanic ash surfaces over very cobbly or very bouldery loamy sand substrata. The dominant soils on cirque headwalls are classified as Andic Cryochrepts and Lithic Cryochrepts. Soils in cirque basins are classified as Typic Cryandeps and Histic Cryaquepts. Rock outcrop, talus, and scree occupy about 40 percent of this component. The dominant natural

vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir on cirque headwalls and basins. The basins also contain Holm's Rocky Mountain sedge, and beaked sedge. This landform represents about 25 percent of this unit.

Alpine ridges were formed by alpine glacial scouring and/or strong periglacial frost shattering of exposed bedrock. Slope gradients range from 50 to 80 percent. Soils on this landform are shallow and somewhat excessively drained. These soils are weakly developed and consist of very stony sandy loam surfaces overlying extremely stony loamy sand substrata. Bedrock occurs at a depth of less than 20 inches. The dominant soil is classified as Lithic Cryorthents; however, only about 20 percent of this landform has a soil cover. Rock outcrop, talus, and scree occupy about 80 percent of this component. The most common potential natural vegetation is alpine larch-alpine fir, whitebark pine-subalpine fir, and subalpine fir series. This landform represents about 15 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA43-M332Bd
LTA43-M332Eb

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located in the Anaconda and Flint Ranges, and Fleeceer Mountains on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin of southwest Montana.

Acreage by Subsection

43-M332Bd	77,602
43-M332Eb	2,698

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of cirques, troughs, and moraines. Parent materials are residuum underlain by limestone and glacial moraines deposited on limestone and a variety of other bedrock types.

Accessory Characteristics: The primary soils are shallow to deep with cobbly loamy textures. The vegetation is a mosaic of grasslands, shrublands, and coniferous forest. Mean annual precipitation ranges from 51 to 127 centimeters (20 to 50 inches). The elevation range of this LTA is 1829 to 3049 meters (6000 to 10000 feet). The dominant slopes have gradients of 25 to 80 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of cirques and troughs, and moraines.

Cirques and troughs are formed in limestone bedrock. Slope gradients range from 45 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Typic and Lithic Cryorthents and Cryochrepts. Rock outcrop occurs on 30 to 90 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 40 percent of this LTA.

Moraines are composed of glacial deposits. Slope gradients range from 0 to 35 percent. Soils on these landforms are deep, moderately developed, with cobbly loamy textures. These soils are classified as Typic Cryochrepts and Cryoboralfs. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is sagebrush, Douglas-fir and subalpine fir series. The dominant vegetation in wetlands is willows, sedge, and subalpine fir. This component represents 60 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA44-M332B

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River basin in southwest Montana.

Acreage by Subsection

44-M332B	18,787

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of cirques, troughs, and moraines. Parent materials are residuum underlain by sandstone and shale bedrock, and moraines deposited on sandstone and shale and a variety of other bedrock types.

Accessory Characteristics: The primary soils are shallow to deep with cobbly loamy textures. The vegetation is coniferous forest. Mean annual precipitation ranges from 46 to 127 centimeters (18 to 50 inches). The elevation range of this LTA is 1768 to 2988 meters (5800 to 9800 feet). The dominant slopes have gradients of 25 to 100 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of cirques and troughs, and moraines.

Cirques and troughs are formed in sandstone and shale bedrock. Slope gradients range from 45 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, and have cobbly loamy textures. These soils are classified as Typic and Lithic Cryorthents and Cryochrepts. Rock outcrop and scree occurs on 30-90 percent of this landscape component. The dominant potential natural vegetation is subalpine fir series. This component represents 60 percent of this LTA.

Moraines are composed of glacial deposits. Slope gradients range from 0 to 35 percent. Soils on these landforms are deep, moderately developed, with cobbly loamy textures. These soils are classified as Typic Cryochrepts and Cryoboralfs. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 40 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA45-M332B
LTA45-M332E
LTA45-M333D

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES: GRANITE

Location: This unit is located in the Bitterroot and Sapphire mountain ranges of western Montana in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

45-M332B	83,690
45-M332E	2,112
45-M333D	3,610

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation broad ridgetop position which is typically composed of weakly expressed glaciated slopes and basins that were formed by ice cap glaciers, minor valley glaciers, and strong periglacial frost shattering. Parent materials are a complex of frost shattered residuum and colluvium, intermixed with glacial till derived from moderately weathered granite.

Accessory Characteristics: The primary soils are shallow to deep, coarse soils with numerous rock fragments and have a volcanic ash surface layer. The vegetation is a mosaic of coniferous forest, stunted wind-deformed forest, and occasional small wet meadows. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 2073 to 2743 meters (6800 to 9000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of weakly developed glacial cirques, and frost shattered mountain ridge tops.

Weakly developed glacial cirques are formed in residuum, colluvium, and till derived from a variety of rock types. Slope gradients range from 20 to 55 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of extremely bouldery loam volcanic ash surface layers overlying very stony loamy sand substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir series. This component represents 65 percent of this unit.

Frost shattered mountain ridge tops are formed in residuum and colluvium. Slope gradients range from 20 to 50 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of very stony loam volcanic ash surface layers overlying very cobbly coarse sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, alpine larch-subalpine fir, and subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA50-M332B

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the lower Bitterroot, Garnet, Sapphire and Swan Mountains of the Upper Clark Fork River basin of northwest Montana.

Acreage by Section

50-M332B	312,518

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on gently to moderately sloping glacial landscape settings. Parent materials are undifferentiated glacial drift composed of argillites, siltites and quartzites. Small areas of residual materials and rock outcrop are also included. These are medium textured.

Accessory Characteristics: The primary soils are deep, moderately coarse to medium textured. The vegetation is, typically, a mosaic of coniferous forest and wetlands. Mean annual precipitation ranges from 64 to 127 centimeters (25 to 50 inches). The elevation range of this unit is 1077 to 1692 meters (3500 to 5500 feet). The dominant slopes have gradients less than 60 percent and, typically, range from 10 to 35 percent. This map unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, seeps, bogs and riparian zones are common components of this unit.

LTA Components: This landtype association consists of gently to moderately sloping glacial moraine.

Gently to moderately sloping glacial moraines are formed in the undifferentiated belt materials, both till and outwash. The rolling plains are dotted with wetlands, seeps, bogs and riparian zones. These areas have slopes that range from 0 to less than 60 percent with moderately coarse to medium textured materials. The major soils are classified as Andic Dystric Eutrochrepts and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir, grand fir, Douglas-fir and spruce.

Compiled by: Skip Barndt, Lolo National Forest

LTA51-M332B

GLACIATED MOUNTAIN SLOPES: GRANITIC

Location: This unit is located in the Bitterroot, Sapphire and Anaconda Mountain Ranges of western Montana and occurs in the Bitterroot, Upper Clark Fork, and the Blackfoot River Basins of western Montana.

Acreage by Section

51-M332B	197,817

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on gently to moderately sloping glacial landscape settings. Parent material is alpine glacial till, alluvium, and residuum derived from granitic sources.

Accessory Characteristics: The primary soils are deep and very deep with coarse to moderately coarse textures. Small inclusions of shallow soils, rock outcrop, and rubble land can also be found within this unit. The vegetation is a mosaic of moderately dry, moist, and wet coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is 1158 to 2134 meters (3800 to 7000 feet). Slope gradients range from 1 to 60 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands, seeps, bogs and riparian zones are major components of this unit.

LTA Components: This landtype association consists of glacial moraines, and floodplains.

Glacial moraines were formed in alpine glacial till. Slope gradients range from 8 to 60 percent and slope shape is convex. Soils on this landform are shallow to deep, and moderately well to somewhat excessively drained. These soils are weakly developed and consist of bouldery loam volcanic ash surface layers overlying very cobbly loamy sand substrata. The dominant soils are classified as: Andic Cryochrepts, Lithic Cryochrepts, Lithic Ustochrepts, and Typic Ustochrepts. Rock outcrop and rubble land occupy about 10 percent of this component. The dominant potential natural vegetation is subalpine fir and Douglas-fir series. This landform component represents about 75 percent of this unit.

Floodplains were formed in coarse alluvium. Slope gradients range from 1 to 8 percent. Soils on this landform are very deep and moderately well to very poorly drained. These soils are very weakly develop and consist of cobbly loam surface layers overlying very gravelly loamy sand substrata. The dominant soils are classified as: Typic Cryaquents, Oxyaquic Cryofluvents, and Andic Cryofluvents. Rock outcrop occurs on less than 5 percent of this component. The dominant natural vegetation is western redcedar, grand fir, and subalpine fir series. This landform represents about 25 percent of this unit.

Compiled by: Bob Spokas, Bitterroot National Forest

LTA53-M332B
LTA53-M333B
LTA53-M333C

**GLACIATED MOUNTAIN SLOPES: SANDSTONES, SHALES, AND
CARBONATES**

Location: This map unit is located in the Swan, Mission, Flathead, and Whitefish mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

53-M332B	6,926
53-M333C	100,613
53-M333B	8,091

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley bottom and upland landscape settings, which are primarily composed of glacial moraine landforms. Parent materials are continental or alpine glacial debris with or without volcanic ash surface layers; underlain by Paleozoic and Mesozoic sandstone, shale, and limestone bedrocks. In the North Fork of the Flathead River areas of Tertiary siltstone are included in this map unit.

Accessory Characteristics: The primary soils are moderately deep to very deep, with gravelly medium and moderately fine textures. The major vegetative cover is a dense coniferous forest with occasional meadow openings. Mean annual precipitation ranges from 51 to 178 centimeters (20 to 70 inches). The elevation range is 1,036 to 2,316 meters (3400 to 7600 feet). The dominant slopes range from 5 to 50 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists primarily of glacial moraine landforms. Glacially scoured ridge tops are a minor component.

On the valley bottom landscape setting the glacial moraines occur on rolling hummocky topography, with slopes that range from 5 to 30 percent slope. On the upland landscape setting the glacial moraines occur on straight to slightly concave slopes, with range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toe-slope associated with glacial troughwalls.

Soils on these landforms are moderately deep to very deep, and are moderate to highly developed, with gravelly moderately-fine or fine textures. The major soils are classified as Typic Eutrochrepts and Andeptic Cryoboralfs. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir.

A minor component of this map unit is glacially scoured ridge tops. Slope gradients range from 5 to 20 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with gravelly medium textures. The major soils are classified as Andic Cryochrepts. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is subalpine fir and Douglas-fir. This component represents 15 percent of this map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA57-M332B

GLACIATED MOUNTAIN SLOPES: SCHISTS

Location: This unit is located in the Bitterroot Mountain Range of western Montana in the Bitterroot River basin.

Acreage by Section
57-M332B 9,352

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in the lower to middle elevation portions of glaciated valleys. Parent material is alpine glacial till, alluvium, and colluvium derived from schist.

Accessory Characteristics: The primary soils are deep and very deep with coarse to moderately coarse textures. Inclusions of shallow soils, rock outcrop, and rubble land occur within this unit. The vegetation is a mosaic of moderately dry, moist, and wet coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is 1280 to 2317 meters (4200 to 7600 feet). Slope gradients range from 5 to 60 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being trellis. Wetlands, seeps, bogs and riparian zones are major components of this unit.

LTA Components: This landtype association consists of lateral moraines and footslopes, terraces and ground moraines, and floodplains.

Lateral moraines were formed in alpine glacial till. Footslopes consist of colluvium from trough walls. Slope gradients range from 30 to 60 percent. Soils on this landform are deep and moderately well to somewhat excessively drained. These soils are weakly developed and consist of cobbly loam to sandy loam surface layers overlying very cobbly sandy loam substrata. North-facing slopes have a cobbly loam volcanic ash surface layer. The dominant soils are classified as: Andic Cryochrepts, Dystric Cryochrepts, and Typic Ustochrepts. Shallow soils, rock outcrop and rubble land occupy about 15 percent of this component. The most common potential vegetation is the subalpine fir and Douglas-fir series. This component represents about 60 percent of this unit. Ground moraines formed in moderately coarse glacial till on valley floors. Terraces formed in coarse outwash and alluvium and represent former floodplains. Slope gradients range from 8 to 35 percent. Soils on this landform are very deep and well drained to excessively drained. These soils are weakly developed and consist of cobbly to bouldery loam surface layers overlying very cobbly to very bouldery sandy loam or loamy sand substrata. The dominant soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Oxyaquic Cryofluvents. Rock outcrop occurs on about 10 percent of this component. The dominant potential natural vegetation is the grand fir and subalpine fir series. This component comprises about 25 percent of this unit.

Floodplains were formed in coarse alluvium. Slope gradients range from 5 to 10 percent. Soils on this landform are very deep and poorly to very poorly drained. These soils are very weakly developed and consist of cobbly loam surface layers overlying very gravelly to extremely cobbly loamy sand substrata. The dominant soils are classified as: Typic Cryaquents, Typic Cryaquepts, and Oxyaquic Cryofluvents. Rock outcrop occurs on less than 5 percent of this component. The dominant natural vegetation is the western redcedar, grand fir, and subalpine fir series. Included in this component are areas of silty wet soils in alluvial basins. These soils support alder, willow, and sedge plant communities. Floodplains represents about 15 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA60-M332B

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot, Sapphire, and Anaconda mountain ranges of western Montana. It occurs in the Middle and Upper Clark Fork River Basin which includes the Bitterroot, Blackfoot, Flint Creek, and Clark Fork drainages.

Acreage by Section

60-M332B	767,352

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a nonglaciaded steep mountain slope setting, below the zone of strong frost shattering, which is typically composed of moderately dissected mountain slopes, ridge tops, and narrow valley bottoms. Parent materials are colluvium and residuum underlain by Precambrian Belt rocks such as argillite, quartzite, and siltite.

Accessory Characteristics: The primary soils are shallow to deep, medium-textured, and have numerous rocks fragments throughout the profile. The vegetation is a mosaic of coniferous forest and native grasslands. Mean annual precipitation ranges from 36 to 89 centimeters (14 to 35 inches). The elevation range is 945 to 2073 meters (3100 to 6800 feet). The dominant slopes have gradients of 10 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes, and ridge tops.

Mountain slopes are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are shallow to deep and well drained. Soils are weakly developed in areas underlain by the coarse-textured rock types, such as quartzite, and having cooler forested habitat types. These soils have gravelly fine sandy loam surface layers and extremely cobbly fine sandy loam substrata. Soils that formed in material derived from fine-textured rocks, such as argillite, and having warmer forested or grassland habitat types are well developed. These soils have gravelly loam surface layers and very cobbly sandy clay loam or clay loam substrata. The dominant soils are classified as Typic and Lithic Ustochrepts, Dystric Cryochrepts, Typic Eutroboralfs, and Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, Idaho fescue and subalpine fir series. This component represents 75 percent of this unit.

Mountain ridge tops are formed in residuum. Slope gradients range from 10 to 35 percent. Soils on this landform are shallow to deep and well drained. These soils are similar to those described above for the mountain slopes landscape component. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and Idaho fescue series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA61-M332B

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot and Sapphire Mountains of west-central Montana in the Bitterroot River Basin

Acreage by Section

61-M332B	92,627

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated, dissected mountain slope setting, below the zone of strong frost shattering, which is typically composed of steep mountain slopes, ridge tops, and narrow valley bottoms. Parent materials are colluvium and residuum underlain by highly weathered granitic bedrock.

Accessory Characteristics: The primary soils are deep, coarse, sandy soils that have numerous rock fragments in the form of weathered gravels and cobbles. The vegetation is a mosaic of coniferous forest and native grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is 1158 to 2073 meters (3800 to 6800 feet). The dominant slopes have gradients of 10 to 55 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes are formed in colluvium. Slope gradients range from 30 to 55 percent. Soils on this landform are deep and excessively drained. These soils are weakly developed and consist of gravelly sandy loam surface layers overlying very gravelly or very cobbly loamy sand substrata. The dominant soils are classified as Typic Ustochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 80 percent of this unit.

Ridge tops formed in residuum and colluvium. Slope gradients range from 10 to 35 percent. Soils on this landform are shallow to deep and excessively drained. These soils are weakly developed and consist of gravelly or very gravelly sandy loam surface layers overlying very gravelly or very cobbly loamy sand substrata. The dominant soils are classified as Lithic Ustochrepts, Typic Ustochrepts, Dystric Cryochrepts, and Typic Haploborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and Idaho fescue series. This component represents 15 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA62-M332B

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot, Sapphire, and Anaconda mountain ranges of western Montana and occurs in the Bitterroot, Blackfoot, and Upper Clark Fork River basins.

Acreage by Section

62-M332B	152,086

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated steep mountain slope landscape setting, below the zone of strong frost shattering, and is typically composed of moderately dissected mountain slopes, ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by weakly weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep, moderately coarse-textured, and have numerous rock fragments throughout the profile. The vegetation is a mosaic of coniferous forest, native grasslands, and at the lowest elevations of the unit, dry shrublands. Mean annual precipitation ranges from 41 to 89 centimeters (16 to 35 inches). The elevation range is 1220 to 2012 meters (4000 to 6600 feet). The dominant slopes have gradients of 10 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes, and ridge tops.

Mountain slopes are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are shallow to deep and well drained. These soils are weakly developed except that on warm, southeast to west-facing slopes, soils are more developed. The weakly developed soils consist of gravelly sandy loam surface layers overlying very cobbly sandy loam substrata. The more developed soils have a gravelly sandy loam surface layer that overlies very gravelly or very cobbly sandy clay loam or clay loam substrata. The dominant soils are classified as Typic and Lithic Ustochrepts, Dystric Cryochrepts, Typic Eutroboralfs, and Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, Idaho fescue, bitterbrush, and subalpine fir series. This component represents 75 percent of this unit.

Mountain ridge tops are formed in residuum. Slope gradients range from 10 to 35 percent. Soils on this landform are shallow to deep and well drained. These soils are similar to those described above for the mountain slopes landscape component. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, bitterbrush, and Idaho fescue series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA63-M332B

MOUNTAIN SLOPES AND RIDGES: SCHISTS AND GNEISSES

Location: This unit is located in the Bitterroot Mountain Range of west-central Montana in the Bitterroot and Clark Fork River Basins.

Acreage by Section

63-M332B 5,513

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated steep mountain slope landscape setting which is typically composed of steep mountain slopes, ridge tops, and minor amounts of landslides and narrow valley bottoms. These are mostly below the zone of strong frost shattering, but because of limited acres, areas of high elevation frost shattered ridges were included in the mapping of this unit. Parent materials are colluvium underlain by schist and gneiss with high amounts of mica.

Accessory Characteristics: The primary soils are deep with sandy loam textures and numerous rock fragments in the profile. The vegetation is a mosaic of coniferous forest with minor amounts of dry, coniferous savannah. Mean annual precipitation ranges from 64 to 178 centimeters (25 to 70 inches). The elevation range is 1524 to 2439 meters (5000 to 8000 feet). The dominant slopes have gradients of 25 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and moderately steep ridge tops.

Steep mountain slopes are formed in colluvium derived from schist and gneiss. A thin layer of volcanic ash occurs at the surface on slopes with northerly aspects. Slope gradients range from 40 to 55 percent. Soils on this landform are deep and well drained. On southerly aspects, these soils are weakly developed and consist of gravelly sandy loam surface layers overlying very cobbly fine sandy loam substrata. On northerly aspects the surface layer is silt loam derived from volcanic ash that overlies very gravelly to very cobbly loam or silt loam substrata. The dominant soils are classified as Dystric Cryochrepts, Andic Cryochrepts, and Typic Ustochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and Douglas-fir series. This component represents 80 percent of this unit.

Mountain ridge tops and associated spur ridges are formed in residuum and colluvium derived from schist or gneiss. Slope gradients range from 25 to 40 percent. Soils on this landform are shallow to moderately deep and well drained. These soils are weakly developed and consist of gravelly sandy loam surface layers that overlie very cobbly to very flaggy fine sandy loam substrata. The dominant soils are classified as Lithic Argiborolls and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 15 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA64-M332Be
LTA64-M332Bk
LTA64-M332De

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located in the Sapphire and Boulder Mountains on the Beaverhead-Deerlodge and Helena National Forests in the upper Clark Fork River Basin in southwest Montana. It also occurs along the Continental Divide in the Alice-Nevada Mountains.

Acreage by Subsection

64-M332Be	12,983
64-M332Bk	7,098
64-M332De	6,116

Map Unit Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a landscape setting which is typically composed of mountain slopes and ridges. Parent materials are residuum and colluvium underlain by rhyolite and tuff. Some ridges have ash influenced soils.

Accessory Characteristics: The primary soils are shallow to moderately deep. The primary soils have medium textured to moderately coarse textured surfaces and moderately coarse to coarse textured subsurface layers. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 46 to 75 centimeters (18 to 30 inches). The elevation range of this LTA is 1677 to 2195 meters (5500 to 7200 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is poorly to moderately dissected by streams. Ridges are mostly undissected. Wetlands are a minor component of this LTA.

Landscape Components: This map unit consists of mountain slopes and ridges.

Mountain slopes and ridges are formed in volcanic bedrock. Slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to moderately deep and weakly to moderately developed. Surface textures range from very gravelly sandy loam on steeper slopes to loams on volcanic ash influenced ridges. Subsurface textures are often very cobbly coarse sandy loam or extremely cobbly loamy sand. These soils are classified as Typic, Dystric, Andic, and Lithic Cryochrepts, Typic and Lithic Cryoboralfs, and Argic and Lithic Cryoborolls. Rock outcrop occurs on 5 to 15 percent of this landscape component. The dominant potential natural vegetation is rough fescue, Douglas-fir and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest, and Larry Laing, Helena National Forest

LTA64-M332B

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This unit is located in the Bitterroot and Sapphire Mountain Ranges of west-central Montana in the Bitterroot, Blackfoot, and Clark Fork River Basins.

Acreage by Section

64-M332B 103,689 (Section except for M332Be and M332Bk)

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a non-glaciated steep mountain slope landscape setting, below the zone of strong frost shattering, which is typically composed of steep mountain slopes, moderately steep ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by volcanic andesites and rhyolites.

Accessory Characteristics: The primary soils are shallow to deep with loamy textures and numerous rock fragments throughout the profile. The vegetation is a mosaic of coniferous forest and dry native grasslands. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). The elevation range is 1524 to 2012 meters (5000 to 6600 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and moderately steep ridge tops.

Steep mountain slopes are formed in colluvium derived from andesite or rhyolite. Slope gradients range from 30 to 55 percent. Soils on this landform are deep and well drained. These soils mostly are well developed and consist of gravelly loam or sandy loam surface layers overlying very gravelly or very cobbly sandy clay loam or clay loam substrata. Similar soils are less well developed and generally have very cobbly sandy loam substrata. The dominant soils are classified as Typic Cryoboralfs, Typic Eutroboralfs, Typic Ustochrepts, and Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, Douglas-fir, and Idaho fescue series. This component represents 70 percent of this unit.

Mountain ridge tops and associated spur ridges are formed in residuum and colluvium derived from andesite or rhyolite. Slope gradients range from 20 to 30 percent. Soils on this landform are mostly shallow to moderately deep and well drained. These soils are well developed and consist of gravelly loam surface layers overlying very gravelly or very cobbly sandy clay loam or clay loam substrata. The dominant soils are classified as Lithic Argiborolls, Typic Cryoboralfs, and Typic Eutroboralfs. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, Douglas-fir and subalpine fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA65-M332B

MOUNTAIN SLOPES AND RIDGES: SOFT SEDIMENTARY ROCKS

Location: This LTA is located in the Flint Range in the upper Clark Fork River Basin in southwest Montana.

Acreage by Section

65-M332B	30,430

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum underlain by soft sedimentary rocks.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1372 to 1829 meters (4500 to 6000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in soft sedimentary rocks. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, with cobbly loamy textures. These soils are classified as Typic Cryochrepts and Cryoboralfs, and Typic and Argic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue and Douglas-fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA66-M332B

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin in southwest Montana.

Acreage by Section

66-M332B	78,732

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum and colluvium underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 64 centimeters (16 to 25 inches). The elevation range of this LTA is 1677 to 2439 meters (5500 to 8000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in limestone bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, with cobbly loamy textures. These soils are classified as Argic and Typic Cryoborolls, and Lithic and Typic Cryochrepts and Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is rough fescue, Idaho fescue, Douglas-fir, and subalpine fir/grouse series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA67-M332B

MOUNTAIN SLOPES AND RIDGES: CALC-SILICATES

Location: This unit is located in the Lower Bitterroot, Garnet, Sapphire and Swan Mountains which is in the Upper Clark Fork River Basin of northwest Montana.

Acreage by Section

67-M332B	72,462

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on mountain sideslope and ridge landscape settings, which are composed of structural mountain lands. Parent materials are moderately weathered calc-silicate belt materials. Rock outcrop is a common feature in this unit.

Accessory Characteristics: The primary soils are shallow to moderately deep loams and sandy loams. The vegetation is a mosaic of coniferous forest and parklands with small amounts of scree. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range of this unit is 985 to 2031 meters (3200 to 6600 feet). The dominant slopes have gradients of less than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Talus and rock outcrops are major components of this map unit.

LTA Components: This landtype association consists of structural mountain slopes and ridges.

These landforms are developing on moderately steep mountain slopes and ridges. The slope gradients range from 35 to 60 percent. Soils on these landforms are shallow to moderately deep and are medium textured. The major soils are classified as Andic Dystric Eutrochrepts, Andic Cryochrepts, Typic Eutroboralfs, Typic Ustochrepts, and Calcixerollic Xerochrepts. Rock outcrops occupy less than 15 to over 50 percent of the area. The dominant potential natural vegetation is Douglas-fir, western red cedar, grand fir and subalpine fir series.

Compiled by: Skip Barndt, Lolo National Forest.

LTA68-M332B

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in southwest Montana in the upper Clark Fork River Basin.

Acreage by Section

68-M332B	84,764

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum underlain by sandstone and shale bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and grasslands. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1524 to 2134 meters (5000 to 7000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in sandstone and shale bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, and have cobbly loamy textures. These soils are classified as Typic and Lithic Cryochrepts and Cryoboralfs; and Argic and Lithic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is rough fescue, Douglas-fir and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA70-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This unit is located in the Bitterroot, Sapphire, and Anaconda Mountain Ranges of western Montana and occurs in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

70-M332B	137,464

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by Precambrian sedimentary Belt rocks.

Accessory Characteristics: The primary soils are deep with fine sandy loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 89 to 152 centimeters (35 to 60 inches). The elevation range is 2012 to 2500 meters (6600 to 8200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel, but as mapped, areas of dendritic drainage pattern also occur in about 30 percent of the unit. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from Belt rocks such as quartzite, argillite, and siltite. Slope gradients range from 35 to 50 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly or cobbly loam or silt loam surface layers and very cobbly to extremely cobbly fine sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 60 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium from quartzite, argillite, and siltite that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of cobbly to extremely cobbly loam or silt loam surface layers that overlie extremely cobbly fine sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 30 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA71-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot and Anaconda Mountain Ranges of western Montana in the Bitterroot River Basin.

Acreage by Section

71-M332B	17,683

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by highly weathered granitic rocks.

Accessory Characteristics: The primary soils are deep with loamy sand textures that have numerous pea-sized and cobble-sized rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 76 to 152 centimeters (30 to 60 inches). The elevation range is 1951 to 2439 meters (6400 to 8000 feet). The dominant slopes have gradients of 10 to 40 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included in this map unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from highly weathered granitic rocks. Slope gradients range from 30 to 40 percent. Soils on this landform are deep and somewhat excessively drained. These soils are weakly developed and consist of gravelly loam or silt loam surface layers and very gravelly loamy-sand or coarse sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Similar soils with loamy-skeletal, mixed substrata occur in this component. Bedrock is highly weathered granitics (grus). Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 70 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from highly weathered granitic rocks that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and somewhat excessively drained. These soils are poorly developed and consist of gravelly loam or silt loam surface layers that overlie very gravelly loamy sand or coarse sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Areas of soils having loamy-skeletal, mixed substrata also occur in this component. Bedrock is highly weathered granitics. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 25 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA72-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot, Sapphire, and Anaconda Mountain Ranges of western Montana in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

72-M332B	94,500

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by weakly weathered granitic rocks.

Accessory Characteristics: The primary soils are deep with sandy loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 76 to 152 centimeters (30 to 60 inches). The elevation range is 1676 to 2500 meters (5500 to 8200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included in this map unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from weakly weathered granitic rocks. Slope gradients range from 30 to 40 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly loam or silt loam surface layers and very gravelly or very cobbly sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 70 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from weakly weathered granitic rocks that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of gravelly loam or silt loam surface layers that overlie very gravelly or very cobbly sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir plant associations. This component represents 25 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA73-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This unit is located in the Bitterroot Mountain Range of western Montana in the Bitterroot River Basin.

Acreage by Section

73-M332B	15,228

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by weakly weathered volcanic rocks.

Accessory Characteristics: The primary soils are deep with sandy loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 1951 to 2439 meters (6400 to 8000 feet). The dominant slopes have gradients of 10 to 40 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from weakly weathered volcanic rocks. Slope gradients range from 30 to 40 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly loam or silt loam surface layers and very gravelly or very cobbly sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 60 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from weakly weathered volcanic rocks that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 20 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of gravelly to extremely cobbly loam or silt loam surface layers that overlie very gravelly or very cobbly sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA74-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES AND SHALES

Location: This LTA is located in the Flint Range of the Beaverhead-Deerlodge National Forest in the upper Clark Fork River Basin in southwest Montana.

Acreage by Section

74-M332B	6,428

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of frost shattered ridges and slopes. Parent materials are residuum and colluvium underlain by sandstone shale, and other mixed sedimentary bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 2134 to 2591 meters (7000 to 8500 feet). The dominant slopes have gradients of 20 to 60 percent. This LTA is slightly dissected by streams, with no apparent dominant stream pattern. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in sandstone, shale and other mixed sedimentary bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Lithic, Argic, and Typic Cryoborolls, and Typic Cryochrepts and Cryorthents. Rock outcrop occurs on about 5 percent of this landscape component and scree occupies an equal, and sometimes larger, area. The dominant potential natural vegetation is rough fescue and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA75-M332B

FROST SHATTERED MOUNTAIN RIDGE TOPS: CALC-SILICATES

Location: This unit is located in the Sapphire Mountain Range of west-central Montana in the Bitterroot Basin.

Acreage by Section

75-M332B	15,252

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by Precambrian calc-silicate (calcium-bearing) and quartzitic rocks.

Accessory Characteristics: The primary soils are deep with fine sandy loam to clay loam textures that have numerous rock fragments in the profile. The vegetation is a fairly uniform cover of coniferous forest. Mean annual precipitation ranges from 89 to 127 centimeters (35 to 50 inches). The elevation range is 1829 to 2439 meters (6000 to 8000 feet). The dominant slopes have gradients of 20 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic; but as mapped, areas of parallel drainage pattern also occur in about 20 percent of the unit. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered mountain slopes, and ridge tops.

Frost shattered mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from calc-silicate and quartzitic rocks. Slope gradients range from 35 to 50 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly or cobbly loam or silt loam surface layers and very cobbly to extremely cobbly fine sandy loam to clay loam substrata. The dominant soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryoboralfs. Rock outcrop and scree occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 75 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium from calc-silicate and quartzitic rocks that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 20 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed and consist of cobbly to extremely cobbly loam or silt loam surface layers that overlie very cobbly fine sandy loam to clay loam substrata. The dominant soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryoboralfs. Rock outcrop and scree occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA80-M332B

LOW RELIEF HILLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Philipsburg valley in the vicinity of the Beaverhead National Forest in southwest Montana. It occurs in the Upper Clark Fork River basin in Subsection M33Be.

Acreage by Section

80-M332B	4,768

Map Unit Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low relief mountain setting and is typically composed of rolling hills. Parent materials are weathered Belt residuum and colluvium.

Accessory Characteristics: The primary soils are deep and loamy. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 46 to 64 centimeters (18 to 25 inches). The elevation range of this unit is 1677 to 2134 meters (5500 to 7000 feet). The dominant slopes have gradients of 10 to 30 percent. This unit is highly dissected by streams, with the stream pattern being strongl dendritic.

Landscape Components: This map unit consists of low relief rolling hills.

Low relief rolling hills are formed in metasediments that consist of quartzites and siltites. The slope gradients range from 10 to 30 percent. Soils on these landforms are deep, moderately to highly weathered and medium textured. The major soils on the well drained sites are classified as Typic and Lithic Cryochrepts and Cryoboralfs. The dominant potential natural vegetation is rough fescue, Douglas-fir and subalpine fir. This component represents 100 percent of this unit.

Compiled by: Dave Ruppert, Beaverhead-Deer Lodge National Forest

LTA81-M332B

LOW RELIEF HILLS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Bitterroot and Sapphire Mountain Ranges of west-central Montana in the Bitterroot River Basin.

Acreage by Section

81-M332B	105,939

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately steep, highly dissected mountain slope landscape setting which is typically composed of dissected slopes, ridge tops, and noses of spur ridges. Parent materials are colluvium and residuum underlain by highly weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with loamy sand to sandy clay loam textures and have numerous rock fragments throughout the profile. The vegetation is a mosaic of dry shrublands, grasslands, and coniferous forest. Mean annual precipitation ranges from 41 to 127 centimeters (16 to 50 inches). The elevation range is 1280 to 2348 meters (4200 to 7700 feet). The dominant slopes have gradients of 5 to 40 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected mountain slopes, and ridge tops.

Dissected mountain slopes are formed in colluvium derived from highly weathered granite. Slope gradients range from 30 to 40 percent. Soils on this landform are moderately deep to deep and somewhat excessively to well drained. These soils are poorly developed to well developed and consist of gravelly sandy loam surface layer that overlies very gravelly to very cobbly loamy sand or sandy clay loam substrata. The dominant soils are classified as Dystric Cryochrepts, sandy-skeletal, mixed; Typic Ustochrepts, Typic Eutroboralfs, and Andic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, Douglas-fir and subalpine fir series. This component represents 60 percent of this unit.

Ridge tops and associated noses of spur ridges are formed in residuum and colluvium derived from highly weathered granite. Slope gradients range from 5 to 20 percent. Soils on this landform are shallow to moderately deep and well drained. These soils are poorly developed to well developed and consist of gravelly or very gravelly sandy loam or loam surface layers over very gravelly or very cobbly sandy loam or sandy clay loam substrata. The dominant soils are classified as Lithic Argiborolls, Lithic Eutroboralfs, Typic Ustochrepts, and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is bitterbrush, Idaho fescue, Douglas-fir and subalpine fir. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA82-M332B

LOW RELIEF HILLS: VOLCANICS

Location: This unit is located in the Bitterroot Mountain Range of west-central Montana in the Bitterroot River Basin.

Acreage by Section

82-M332B	10,401

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately steep, highly dissected mountain slope landscape setting which is typically composed of dissected slopes, ridge tops, and noses of spur ridges. Parent materials are colluvium and residuum underlain by weakly weathered volcanic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with loam to clay textures; rock content is highly variable throughout the profile. The vegetation is a mosaic of coniferous forest with scattered patches of coniferous savannah. Mean annual precipitation ranges from 64 to 102 centimeters (25 to 40 inches). The elevation range is 1463 to 1951 meters (4800 to 6400 feet). The dominant slopes have gradients of 10 to 40 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected mountain slopes, and ridge tops.

Dissected mountain slopes are formed in colluvium derived from weakly weathered rhyolitic and andesitic volcanic rocks. Slope gradients range from 20 to 40 percent. Soils on this landform are moderately deep to deep and well drained. These soils are mostly well developed and consist of gravelly loam surface layer that overlies very gravelly to very cobbly sandy clay loam to clay substrata. The dominant soils are classified as Typic Eutroboralfs, Typic Eutroboralfs, and Typic Ustochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 70 percent of this unit.

Ridge tops and associated noses of spur ridges are formed in residuum and colluvium derived from weakly weathered rhyolitic and andesitic volcanic rocks. Slope gradients range from 10 to 30 percent. Soils on this landform are shallow to moderately deep and well drained. These soils are well developed and consist of gravelly or very gravelly sandy loam or loam surface layers over very gravelly or very cobbly clay loam or sandy clay loam substrata. The dominant soils are classified as Lithic Argiborolls, Lithic Eutroboralfs, and Typic Ustochrepts. Rock outcrop occurs on less 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir series. This component represents 25 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA83-M332B

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This unit is located in the Bitterroot and Sapphire Mountain Ranges of western Montana. It occurs in the Bitterroot, Blackfoot, and Upper Clark Fork River Basins. On the Helena National Forest it occurs in the Avon Valley and the Nevada Creek and Sturgeon Creek drainages.

Acreage by Section

83-M332B	295,900

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately steep, highly dissected Tertiary-age valley fill landscape setting which is typically composed of dissected slopes, ridge tops, and planar terrace treads. Parent material is old, weathered alluvium derived from mixed sources.

Accessory Characteristics: The primary soils are deep with loam to clay loam textures; rock content is highly variable throughout the profile. The vegetation is a mosaic of native grassland and coniferous forest. Mean annual precipitation ranges from 30 to 76 centimeters (12 to 30 inches). The elevation range is 1067 to 1829 meters (3500 to 6000 feet). The dominant slopes have gradients of 5 to 50 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected terrace scarp slopes, and ridge tops/terrace treads.

Dissected terrace slopes are formed in alluvium derived from granitic, Belt, and volcanic rocks. Slope gradients range from 25 to 50 percent. Soils on this landform are deep and well drained. These soils are mostly well developed and consist of a cobbly loam surface layer that overlies very cobbly loam or clay loam substrata. The dominant soils are classified as Aridic and Typic Argiborolls, Typic Haploborolls, and Typic Eutroboralfs. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is rough fescue, big sagebrush, Idaho fescue and Douglas-fir series. This component represents 50 percent of this unit.

Ridge tops and terrace treads are formed in alluvium derived from mixed sources such as granitic, volcanic, and Belt rocks. Slope gradients range from 5 to 25 percent. Soils on this landform are deep and well or moderately well drained. These soils are well developed and consist of cobbly or very cobbly loam surface layers over very cobbly clay loam or loam substrata. The dominant soils are classified as Aridic and Typic Argiborolls, Typic Eutroboralfs, and Typic Eutroboralfs. Rock outcrop occurs on less 1 percent of this landscape component. The dominant potential natural vegetation is rough fescue, big sagebrush, and Douglas-fir series. This component represents 45 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA90-M332Bk

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is scattered throughout the Alice-Nevada Mountains within the Clark Fork basin.

Acreage by Subsection

90-M332Bk	4,177

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are old landslide deposits underlain by well weathered volcanic and metasedimentary rock.

Accessory Characteristics: The primary soils are very deep and have clayey subsoils. The vegetation is coniferous forest. Mean annual precipitation ranges from 50 to 63 centimeters (20 to 25 inches). The elevation range of this LTA is 1373 to 2012 meters (4500 to 6600 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being deranged. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of landslides.

Landslides are formed in landslide deposits associated with well weathered volcanic and metasedimentary bedrock. Slope gradients range from 10 to 40 percent. Soils on these landforms are very deep and well developed. They have moderately fine textured surface layers and strong subsoil clay accumulations. They typically have silty clay loam surface textures. Subsoils are silty clay loam and silty clay with 15 to more than 35 percent rock (mostly gravel and cobble). These soils are classified as Mollic Cryoboralfs. Inclusions of Typic Cryaquolls are in bogs. At lower elevations Typic Eutroboralfs are more typical. The dominant potential natural vegetation is subalpine fir and Douglas-fir.

Compiled by: Larry Laing, Helena National Forest

LTA90-M332Bd

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located in the Flint Range on the Beaverhead-Deerlodge National Forest in the upper Clark Fork River basin in southwest Montana.

Acreage by Subsection

90-M332Bd	17,222

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of slumps and landflows. Parent materials are slump and landflow deposits underlain by glacial moraine and Tertiary sedimentary rocks.

Accessory Characteristics: The primary soils are deep, with loamy and clayey textures. The vegetation is a mosaic of mountain meadows and coniferous forest. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1677 to 2287 meters (5500 to 7500 feet). The dominant slopes have gradients of 10 to 35 percent. This LTA is highly dissected by streams, with the dominant stream pattern being parallel and deranged. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of a complex of slumps and landflows.

Slumps and landflows are formed in glacial moraine and Tertiary sedimentary rocks. Slope gradients range from 10 to 45 percent. Soils on these landforms are deep, moderately developed, with loamy and clayey textures. These soils are classified as Typic Cryoboralfs and Typic and Oxyaquic Cryochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series with inclusions of hairgrass, sedge, and willow. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA90-M332B

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in the Bitterroot Mountain Range of west-central Montana and occurs in the Bitterroot River Basin.

Acreage by Section

90-M332B 7,375 (rest of Section except M332Bk and M332Bd)

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a steep mountain slope landscape setting, which is typically composed of moist to wet mass wasting and colluvial mountain slopes. Parent materials are landslide deposits and colluvium underlain by micaceous schist bedrock.

Accessory Characteristics: The primary soils are deep, loamy soils with high content of schist rocks. The vegetation is a mosaic of moist to wet coniferous forest. Mean annual precipitation ranges from 64 to 140 centimeters (25 to 55 inches). The elevation range is 1585 to 2317 meters (5200 to 7600 feet). The dominant slopes have gradients of 25 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being incipient dendritic. Wetlands and ponds are a major component of this unit.

LTA Components: This landtype association consists of steep mountain slopes, and landslides.

Steep mountain slopes are formed in colluvium derived from micaceous schist. Slope gradients range from 35 to 50 percent. Soils on this landform are deep and well or moderately well drained. These soils are poorly developed and consist of loam or silt loam surface layers overlying sandy loam or fine sandy loam substrata. The dominant soils are classified as Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir series. This component represents 70 percent of this unit.

Landslides are formed in unconsolidated landslide debris. Slope gradients range from 25 to 40 percent. Soils on this landform are deep and very poorly to somewhat poorly drained. These soils are poorly developed and consist of gravelly loam or silt loam surface layers that overlie very cobbly fine sandy loam or sandy loam substrata. The dominant soils are classified as Typic Cryaquepts, Andic Cryochrepts, and Dystric Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. About 20% of this component is comprised of soils having seasonally high water tables within a foot of the surface. The dominant potential natural vegetation is subalpine fir series. This component represents 20 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA92-M332B
LTA92-M332E
LTA92-M332D

COLLUVIAL DEPOSITS: MIXED GEOLOGY

Location: This LTA is located throughout the Helena National Forest.

Acreage by Section

92-M332B	6,383
92-M332E	3,557
92-M332D	12,928

Map Unit Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are colluvial deposits, in basins and on toeslopes, typically influenced by metasedimentary and volcanic rocks.

Accessory Characteristics: The primary soils are very deep and have loamy or clayey subsoils. The vegetation is coniferous forest. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1464 to 2135 meters (4800 to 7000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is highly dissected (but weakly incised) by streams, with the dominant stream pattern being parallel or subparallel. Wetlands are a major inclusion in this LTA.

Landscape Components: This map unit consists of one component:

Colluvial deposits are derived from metasedimentary and volcanic rock. Some areas are also influenced by limestone colluvium. Slope gradients range from 10 to 50 percent. Soils on these landforms are very deep and weakly to well developed. They have moderately fine textured surface layers and high subsoil clay accumulations. They typically have very cobbly loam or cobbly silt loam surface textures. Subsoils are very cobbly loam, clay loam or silty clay loam. These soils are classified as Typic Cryochrepts, Typic Cryoboralfs, and Argic Cryoborolls. Inclusions of Aquic Cryoborolls, Aquic Cryoboralfs and Typic Cryaquepts are associated with seeps and springs. The dominant potential natural vegetation series are subalpine fir, spruce, and Douglas-fir.

Compiled by: Larry Laing, Helena National Forest

CHAPTER 7

LTA Descriptions

Section M332C Rocky Mountain Front

This Section occurs in northwest Montana. It is a portion of the Rocky Mountain/Beartooth Front major geomorphic area previously described. Twenty three LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. Map unit descriptions are preceded by the following illustrations.

Figure 25: Map showing location of M332C within the Northern Region

Figure 26: M332C landscape photograph
Lewis Range, Glacier National Park

Figure 27: Map showing distribution of LTAS within M332C

Figure 28: Bar chart showing abundance of landform groups within M332C

Figure 29: Bar chart showing abundance of geologic material groups within M332C

LTA10-M332C
LTA10-M332D
LTA10-331D

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in all mountain ranges of the Lewis and Clark and Helena National Forests.

Acreage by Section	
10-M332C	17,094
10-M332D	86,889
10-331D	982

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in a valley bottom landscape setting which is usually composed of stream terraces, floodplains, and alluvial fans. Parent materials are stratified alluvial deposits of sands, silts and gravels.

Accessory characteristics: The primary soils are deep gravelly to extremely gravelly sandy loams and loams. The vegetation is a mosaic of deciduous forest, coniferous forest, well drained grassland and wet meadow. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1159 to 1983 meters (3800 to 6500 feet). The dominant slopes are 0 to 4 percent. This LTA by nature has very high stream densities. Wetlands are an important component of this LTA.

LTA Components: This landtype association consists of floodplains, and stream terraces and alluvial fans.

Floodplains and lower terraces are formed in a variety of stratified alluvium. These floodplains have slope gradients that range from 0 to 2 percent. Soils on these landforms are very deep, poorly developed, and consist mainly of sand, gravel and cobble. Silts and clays are found to a lesser extent in oxbow positions and areas historically occupied by beaver dams. The major soils are highly variable and include Fluvents, Aquepts, Aquepts, Aquolls and Borolls. The dominant potential natural vegetation series are Englemann spruce and subalpine fir with inclusions of black cottonwood. This component represents 60 percent of this LTA.

Higher terraces and included fans are formed in alluvium. These terraces have slope gradients that range from 0 to 4 percent. The alluvial fans often have slope gradients of 8 to 25 percent. Soils on these landforms are deep, poorly to well developed, and consist mainly of gravelly to extremely gravelly sandy loams and loams. Sand, gravel and/or cobble layers or lenses are often present. Areas of silt and clay are present in old oxbow and beaver dam locations as well as glacial ice dams. The major soils are classified as Haploborolls and Cryoborolls. The dominant potential natural vegetation series are Douglas-fir, rough fescue, and big sagebrush. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena and Lewis and Clark National Forest

LTA12-M332C

VALLEYS: OUTWASH DEPOSITS

Location: This unit is located along the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

12-M332C	40,434

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a major river valley setting which is typically composed of glacial ground and lateral moraines with coalescing glacial outwash fans and stream terraces. Parent materials range from silty old lake bed deposits to gravelly and sandy glacial outwash.

Accessory Characteristics: The primary soils are very deep with coarse textures and numerous rock fragments. The vegetation is principally lodgepole pine forest. Mean annual precipitation ranges from 50 to 127 centimeters (20 to 50 inches). The elevation range is 1402 to 2073 meters (4600 to 6800 feet). The dominant slopes have gradients of 25 to 60 percent. This unit is slightly dissected to highly dissected by low order streams, with the dominant stream pattern being parallel. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of ground moraines, and steep lateral moraines.

Forested glacial ground moraines form on hilly rolling valley floors containing glacial drift deposits and glacially scoured low relief bedrock hills. Slope gradients range from 2 to 20 percent. Soils are developed in parent material ranging from silty old lake beds to gravelly and sandy glacial outwash. Soils on this landform are very deep and can be poorly drained in some areas. They have loamy topsoils underlain by clayey subsoils. The dominant soils are classified as Typic and Andic Cryoboralfs. Rock outcrop does not occur in this landscape component. The dominant potential natural vegetation is spruce and subalpine fir. This component represents 40 percent of this unit.

Forested steep lateral moraines are formed in clayey, slowly permeable glacial drift. Slope gradient range from 25 to 60 percent. Soils on this landform are very deep and poorly drained. These soils are weakly developed in thick layers of silty wind deposited volcanic ash overlying clayey, slowly permeable glacial drift. They typically have loamy topsoils and clayey subsoils. The dominant soils are classified as Andic Cryochrepts in a clayey skeletal family. Perched watertables develop above clayey subsoils during snowmelt. Rock outcrop is rare. The dominant potential natural vegetation is subalpine fir. This component represents 60 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA20-M332C

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the southern part of the Rocky Mountain Front in northwest Montana. It occurs mostly on the Lewis and Clark National Forest.

Acreage by Section

20-M332C	13,659

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep slopes or faulted landscape setting which is typically composed of structural or stream breaks. Parent material is colluvium and residuum derived from metamorphosed Precambrian sedimentary bedrock; mostly quartzites and siltites with some limestone. Some areas are overlain by silty volcanic ash.

Accessory Characteristics: The primary soils develop in very gravelly or stoney colluvium. They are typically deep, loamy soils. The vegetation is mixed open forest (60 percent), bunchgrass parks (20 percent), and dense lodgepole pine forest (20 percent). Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches), 50 percent of which falls as snow. The elevation range is 1805 to 2460 meters (4000 to 7000 feet). The dominant slopes have gradients from 55 to 80 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being subparallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 55 to 70 percent. Soils on these landforms are deep and well drained. These soils are weakly developed, and consist of loamy textures, and have silty topsoils over stoney colluvium or stoney loamy subsoils. The dominant soils are Typic and Andic Cryochrepts, Typic Ustochrepts, and Lithic Cryandepts. Rock outcrop and talus occupy about 10 to 50 percent of this landscape. On cool, mesic sites the dominant potential natural vegetation is lodgepole pine or mixed spruce and subalpine fir. On warmer, drier sites the dominant natural vegetation is Douglas-fir at lower elevations, and subalpine fir at upper elevations. Stream and structural breaks represent 100 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA25-M332C

BREAKS: SANDSTONES AND SHALES

Location: This LTA occurs on the Lewis and Clark National Forest.

Acreage by Section

25-M332C	4,114

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of structural and stream breaks. Parent materials are residuum underlain by sandstone, shale and other mixed sedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with gravelly textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range of this LTA is 1676 to 2286 meters (5500 to 7500 feet). The dominant slopes have gradients of 55 to 70 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being sub parallel to parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered sandstone, shale, and other mixed sedimentary bedrock. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to moderately deep with gravelly textures. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on between 10 to 50 percent of this landscape component. The dominant potential natural vegetation at lower elevations is Douglas-fir and at higher elevations subalpine fir, and whitebark pine-subalpine fir. This component makes up 70 percent of this unit.

Stream breaks are formed in very steep, stream dissected sandstone, shale, and other mixed sedimentary bedrock. Slope gradients range from 45 to 75 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with gravelly textures. These soils are classified as Typic Cryochrepts and Typic Ustochrepts. Rock outcrop occurs on 10 to 30 percent of this landscape component, depending on rock type. The dominant potential natural vegetation is the Douglas-fir series at lower elevations and subalpine fir at higher elevations. This component represents 30 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA27-M332C
LTA27-M333C
LTA27-331D

BREAKS: CARBONATES

Location: This LTA is located in the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

27-M332C	97,585
27-M333C	461
27-331D	149

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of structural breaks. Parent materials are residuum underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with loamy skeletal textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 51 to 54 centimeters (20 to 25 inches). The elevation range of this LTA is 1968 to 2460 meters (6000 to 7500 feet). The dominant slopes have gradients of 60 to 80 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being subparallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of structural breaks.

Structural breaks are formed by thrust faulting along the eastern edge of the overthrust belt, and are most dramatic in limestone bedrock. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed, overlie calcareous, very stony colluvium, and have loamy skeletal textures. These soils are classified as Lithic and Typic Ustochrepts and Typic Cryochrepts. Rock outcrop occurs on 15 to 50 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA29-M332C

BREAKS: QUARTZITES AND CALC-SILICATES

Location: This LTA occurs on the Lewis and Clark National Forest.

Acreage by Section

29-M332C	585

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on a very steep, deeply eroded landscape setting which is typically composed of stream breaks. Parent material is colluvium and residuum derived from weakly weathered quartzite and calc-silicates of the Belt Supergroup.

Accessory Characteristics: The primary soils are shallow to deep with very gravelly, very cobbly or extremely cobbly coarse to medium textures. The vegetation is a mosaic of dry to moist coniferous forest. Mean annual precipitation ranges from 46 to 89 cms. (18 to 35 inches). The elevation range is 1676 to 2286 meters (5500 to 7500 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Rock outcrop, talus, and scree combined, are major components of this map unit. Wetlands are a minor component of this unit. Relatively wide valley bottoms occur in this unit, but are generally considered only map unit inclusions.

LTA Components: This landtype association consists of stream breaks.

These landforms are formed in colluvium and residuum. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to deep and well drained. These soils are weakly to moderately developed, and consist of very cobbly loam surfaces overlying extremely cobbly fine sandy loam substrata. The dominant soils are classified as Typic Cryochrepts. Rock outcrop, talus and scree occupy about 25 percent of this map unit. On warmer, drier sites the dominant natural vegetation is Douglas-fir series. On cool, mesic sites the dominant potential natural vegetation is subalpine fir series. Stream breaks represent about 85 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA34-M332C
LTA34-M332D
LTA34-331D

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Highwood, Little Belt, and Crazy Mountains.

Acreage by Section

34-M332C	233
34-M332D	15,602
34-331D	6,622

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep mountain slopes composed of convex ridges and shoulders in complex with smooth surfaces. Parent material is sandstone, granite, and basalt.

Accessory Characteristics: The primary soil is shallow to moderately deep very gravelly or stony loam or sandy loam. The vegetation is coniferous forest. Mean annual precipitation ranges from 46 to 76 centimeters (18 to 30 inches). The elevation range is 1830 to 2288 meters (6,000 to 7,500 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of very steep mountain slopes.

These mountain slopes are formed in sandstone, granite and basalt. Slope gradient is greater than 60 percent. Soil on this landform is shallow to moderately deep, weakly developed and consists mainly of very gravelly or stony colluvial material. These soils are classified as Typic Cryochrepts. Typically 10 to 25 percent of this landtype consists of rock outcrop. The dominant potential vegetation is subalpine fir series with some scree. This component represents the entirety of this LTA.

Compiled by: Rich Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena/Lewis and Clark National Forests

LTA36-M332C
LTA36-M332D
LTA36-331D

HIGH RELIEF MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Lewis and Clark National Forest except in the Little Snowy Mtns.

Acreage by Section

36-M332C	13,447
36-M332D	12,447
36-331D	764

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep unglaciated mountain slopes typically composed of convex ridges and shoulders in complex with smooth surfaces. Parent materials are non-carbonate and sedimentary.

Accessory Characteristics: The primary soils are shallow to moderately deep extremely gravelly loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). The elevation range of this LTA is 1829 to 2743 meters (6000 to 9000 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being radial. Wetlands and lakes are virtually non-existent in this LTA.

LTA Components: This landtype association consists of convex ridges and shoulders in complex with smooth surfaces. All of these landforms occur on non-carbonate sedimentary rocks.

The convex ridges and shoulders have slope gradient of 25 to greater than 60 percent. Soils on these landforms are shallow to moderately deep, poorly developed, and consist mainly of extremely gravelly sandy loam. The major soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on 75 percent of this unit. The dominant potential natural vegetation series is subalpine fir-whitebark pine.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA37-M332C

HIGH RELIEF MOUNTAIN SLOPES: CARBONATES

Location: This LTA occurs in the southern part of the Rocky Mountain front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

37-M332C	4,666

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting which is typically composed of mountain slopes and narrow ridges. Parent materials are colluvium and residuum underlain by limestones and calcareous argillite.

Accessory Characteristics: The primary soils are moderately deep and shallow with extremely lime and rocky subsurface layers. The vegetation is a mosaic of coniferous forest with scattered grasslands and shrublands. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1739 to 2592 meters (5700 to 8500 feet). The dominant slopes have gradients of 40 to 60 percent. This LTA is moderately to slightly (moderately to widely spaced) dissected and weakly incised by streams, with the dominant stream patterns being subparallel and parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in limestone or calcareous argillite colluvium and residuum. Slope gradients range from 25 to 90 percent. Soils on these landforms are mostly moderately deep and shallow, weakly developed and are loamy. These soils are classified as Typic and Lithic Cryoborolfs, and Typic and Andic Cryochrepts. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir series. Subalpine fir series dominates on northerly aspects.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA40-M332C

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the northern and southern part of the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

40-M332C	242,389

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a steep, alpine glacial landscape setting. Parent materials are alpine glacial debris and colluvium derived from metasediments composed of argillites, siltites and quartzites.

Accessory Characteristics: The primary soils are shallow to moderately deep and cobbly or gravelly to very stoney. The vegetation is a mosaic of coniferous forest and shrubland associated with avalanche chutes. Mean annual precipitation ranges from 51 to 254 centimeters (20 to 100 inches). The elevation range of this unit is 1676 to 3048 meters (5500 to 10,000 feet). The dominant slopes have gradients greater than 60 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wet areas are associated with cirques basins and are a minor component of this unit.

LTA Components: This landtype association consists of steep glaciated valley sideslopes, and peaks and alpine ridges.

Steep glaciated valley sideslopes, including glacial troughwalls, are formed glacial tills on lower elevations and colluvium on higher elevation slopes. Slopes range from 25 to 80 percent. Soils on the upper part of the landform are shallow to moderately deep residuals and consist of rock and medium textured materials. Soils on the lower slopes are moderately deep to deep with cobbly medium textures. The major soils are classified as Typic and Andic Cryochrepts. Rock outcrops occupy up to 40 percent of the area. The dominant potential natural vegetation is subalpine fir. This landform component makes up 80 percent of the unit.

Peaks and alpine ridges include steep to very steep peaks, glacial cirque headwalls, and fault escarpment landforms. Slope gradients range from 60 to 100 percent. Rockland talus makes up more than 70 percent on this unit. Less than 30 percent of the unit has a soil mantle. Soils develop in very stoney colluvial deposits and are deep and loamy. Vegetation is sparse, but the dominant potential natural vegetation is subalpine fir. This landform component represents 20 percent of the unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA43-M332C
LTA43-M332D
LTA43-M333C
LTA43-331D

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located mostly on the Rocky Mountain Front on the Lewis and Clark National Forest.

Acreage by Section

43-M332C	158,089
43-M332D	12,878
43-M333C	235
43-331D	625

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically occupied by fault escarpments (especially in M332C), cirques, troughwalls, and ridges. The parent material is limestone.

Accessory Characteristics: The primary soils are Lithic Cryorthents and Cryochrepts, loamy-skeletal, mixed, cryic. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). The dominant slope gradients are 70 to 90 percent. This LTA is moderately dissected by streams and the dominant drainage pattern is dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of steep west facing slopes, very steep glacial breaks, and rockland/scree on fault escarpments.

The steep west facing slopes are formed in limestone. These slopes have gradient ranging from 40 to 60 percent. Soils on these landscapes are shallow, poorly developed, and consist mainly of loam and flaggy gravel. These soils are classified as Lithic Cryorthents. Rock outcrop occurs on less than 15 percent of this landscape component. The dominant potential vegetation is open growing wind deformed Douglas-fir, limber pine, and spruce on scree. This component represents 30 percent of this LTA.

The very steep glacial breaks are formed in limestone. Slope gradients are mainly greater than 60 percent. The soils of this landscape are deep, poorly developed, and consist mainly of sandy-loam and gravel. These soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on seventy-five percent of this landscape component. The dominant potential vegetation is Douglas-fir series. This component represents 30 percent of this LTA.

The rockland/scree component of this LTA occur on fault escarpments in limestone. Slopes are mainly greater than 60 percent. Soil on this landscape consists of sandy loam, loamy sand, gravel, and cobble. These materials are classified as scree. The dominant potential vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA44-M332C
LTA44-M332D
LTA44-331D

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is extensive throughout the Rocky Mountain Division on the Lewis and Clark Forest and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

44-M332C	101,583
44-M332D	15,947
44-331D	98

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically composed of glacial cirque headwalls and rockland/scree on fault escarpments in Section M332C, and glacial cirques in Section M332D. The parent material is sandstone and/or shale.

Accessory Characteristics: The primary soils are deep extremely cobbly sandy loams and loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1500 to 2896 meters (5000 to 9000 feet). The dominant slopes have gradients of 40 to greater than 60 percent. This association is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of glacial cirques, rockland, and scree on fault escarpments.

Glacial cirques are formed in sandstone and shale. Soils on these landforms are from very shallow to moderately deep, poorly developed, and consist mainly of sandy loam and angular cobble. The major soils are classified as Typic, Andic and Lithic Cryochrepts. Rock outcrop occurs on 5 to 15 percent of this landscape component. The dominant potential natural vegetation series are subalpine fir and whitebark pine. This component represents 60 percent of this unit.

Rockland occurs on a variety of non-carbonate rocks. This component is a miscellaneous landtype and is classified as scree. It does support some alpine fir and whitebark pine. This component represents 25 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest, and Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA50-M332C

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit occurs mostly in the northern part of the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

50-M332C	36,540

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on gently to moderately sloping glacial landscape settings. Parent materials are undifferentiated glacial drift underlain by Proterozoic argillites, siltites, limestones and quartzites.

Accessory Characteristics: The primary soils are deep, with very gravelly moderately coarse and medium textures. The vegetation is dense coniferous forest with occasional meadow openings. Mean annual precipitation ranges from 36 to 203 centimeters (40 to 80 inches). The elevation range of this unit is 853 to 2286 meters (2800 to 7500 feet). The dominant slopes have gradients from 20 to 50 percent. This map unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, seeps, bogs and riparian zones are minor components of this unit.

LTA Components: This landtype association consists of gently to moderately sloping glacial moraines.

Gently to moderately sloping glacial moraines are formed in the undifferentiated Proterozoic materials. In valley bottoms, they form a rolling, hummocky topography with slopes that range from 5 to 30 percent. On upland landscape settings, glacial moraines occur on straight to slightly concave slopes which range from 20 to 55 percent in gradient. Soils are moderately deep to very deep, moderately to highly developed, with gravelly medium textures. The major soils are classified as Andic Dystric Eutrochrepts and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir, grand fir, Douglas-fir and spruce.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA53-M332C
LTA53-M332D

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Lewis and Clark National Forest.

Acreage by Section

53-M332C	164,005
53-M332D	10,191

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on an alpine glacial till landform which is typically composed of outwash benches, drift plastered trough walls, and hilly valley bottoms. Parent materials are sandstones and shales.

Accessory Characteristics: The primary soils are deep, very cobbly loams. The vegetation is subalpine forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1524 to 1981 meters (5000 to 6500 feet). The dominant slopes have gradients of 10 to 40 percent. This landtype association is moderately dissected by streams with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of clayey glacial drift deposits, drift plastered trough walls, hilly valley bottoms, and hilly glaciated valleys.

The clayey glacial drift deposits are formed mainly in sandstone and shale material. Slope gradients range from 25 to 40 percent. The soils on these landforms are deep, weakly developed, and loamy-skeletal. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation is the subalpine fir series.

The drift plastered trough walls are formed mainly in sandstone and shale material. Slope gradients range from 25 to 40 percent. The soils on these landforms are deep, weakly developed, and loamy-skeletal. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation is the Douglas-fir series.

The hilly valley bottoms are formed mainly in sandstone and shale. Slope gradients range from 10 to 25 percent. The soils on these landforms are moderately deep, weakly developed, and loamy-skeletal. These soils are classified as Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape. The dominant natural vegetation is the Douglas-fir series.

The hilly glaciated valleys are formed mainly in sandstone and shale. Slope gradients range from 10 to 25 percent. The soils on these landforms are moderately deep, weakly developed, clay loams with 35 to 50 percent gravel. These soils are classified as Argic Cryoborolls. Rock outcrop occurs on less than 5 percent of this LTA. The dominant natural vegetation is the rough fescue series.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA60-M332C

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the southern part of the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

60-M332C	57,511

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of dissected mountain slopes, glaciated mountain slopes, and glacially scoured ridge top landforms. Parent materials are colluvium and residuum underlain by Proterozoic metasedimentary bedrock, composed of argillites, siltites, quartzites, and limestone.

Accessory Characteristics: The primary soils are shallow to moderately deep, with very gravelly medium textures. The vegetation is a mosaic of coniferous forest and mountain shrub/grass lands. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range is 1524 to 2438 meters (5000 to 8000 feet). The dominant slopes have gradients of 25 to 60 percent. This unit is moderately to strongly dissected by streams, with the dominant stream patterns being dendritic and subparallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of dissected mountain slopes, and glacially scoured ridge tops.

Dissected mountain slopes are formed in colluvium and residuum. Slope gradients range from 25 to 60 percent. Soils on this landform are shallow to deep and well drained. Soils are weakly to moderately developed with medium textures. These soils generally have silty topsoils overlying stoney, loamy subsoils. The dominant soils are classified as Andic Cryochrepts, and Typic or Lithic Cryoborolls. Rock outcrop occupy less than 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 60 percent of this unit.

Glacially scoured ridge tops feature ridge tops and ridge noses in exposed bedrock. Slope gradients range from 25 to 50 percent. Soils on this landform are comprised of thin layers of volcanic ash overlying stoney loamy materials weathered from underlying rock. Dominant soils are classified as Andic Cryochrepts. Rock outcrop occurs on about 50 percent of this landscape component. The dominant potential natural vegetation is subalpine fir-whitebark pine. This component represents 40 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA66-M332C
LTA66-M333C

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located primarily in the middle and southern part of the Rocky Mountain front in Northwest Montana.

Acreage by Section

66-M332C	37,295
66-M333C	164

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on ridgetops, plateaus, steep valley slopes, and benchy lower valley slopes. Parent materials are Paleozoic limestones.

Accessory Characteristics: The primary soils are moderately deep, loamy-skeletal loams, silt loams, and clay loams. The vegetation is a coniferous forest. Mean annual precipitation ranges from 50 to 127 centimeters (20 to 50 inches). The elevation range of this LTA ranges from 1524 to 2896 meters (5000 to 9500 feet). The dominant slopes have gradients of 10 to greater than 60 percent.

LTA Components: This landtype association consists of ridge-tops, and steep valley sideslopes. All of these landforms are typically formed on limestone.

Ridge tops typically have slopes of 10 to 25 percent. Soils on these landforms are moderately-deep, weakly developed, and consist mainly of loamy-skeletal silt loams, loams, and clay loams. The major soils are classified as Perelgic and Typic Cryoborolls. The major potential natural vegetation is rough fescue. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 30 percent of this LTA.

Steep valley sideslopes are on slopes of 25 to 60 percent. Soils on these landforms are moderately deep, moderately well developed, Andic Cryochrepts in the loamy skeletal families. The major potential natural vegetation is subalpine fir. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 70 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA68-M332C
LTA68-M332D
LTA68-331D

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Little Belt Mountains and along the Rocky Mountain Front on the Lewis and Clark National Forest, and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

68-M332C	80,557
68-M332D	336,224
68-331D	8,549

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain slope or ridge setting which is typically composed of stream-dissected mountain slopes and ridges. Parent materials are sandstone and shale.

Accessory Characteristics: The primary soils are moderately deep, skeletal loamy sands and loams. The vegetation is a mosaic of subalpine fir and rough fescue series. Mean annual precipitation ranges from 36 to 89 centimeters (14 to 35 inches). The elevation range is from 1524 to 2438 meters (5000 to 8000 feet). The slope gradient is from 10 to 60 percent. This LTA is moderately dissected by streams with the dominant pattern being parallel. Wetlands are a minor component.

LTA Components: This landtype association consists of low relief ridges and slopes, and steep valley sideslopes.

The low relief ridges and slopes are formed in sandstone and shale. Slope gradients are from 10 to 40 percent. Soils on these landforms are moderately deep to deep, moderately well developed, extremely gravelly loams. These soils are classified as Typic and Argic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation series are rough fescue, Douglas-fir and subalpine fir. This component represents 55 percent of this LTA.

The steep valley sideslopes are formed in sandstone and shale. Slope gradients are from 40 to 60 percent. Soils on these landforms are loamy or sandy-skeletal. These soils are classified mostly as Typic and Andic Cryochrepts with some Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation series is subalpine fir. This component represents 30 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA70-M332C

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This unit is located in the northern and southern part of the Rocky Mountain front in northwestern Montana. It occurs on the Lewis and Clark National Forest.

Acreage by Section

70- M332C	10,583

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridge tops and adjacent steep mountain slopes. Parent materials are colluvium and residuum underlain by Precambrian metasedimentary Belt rocks.

Accessory Characteristics: The primary soils are deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest and bunchgrass parks. Mean annual precipitation ranges from 50 to 152 centimeters (20 to 60 inches). The elevation range is 1676 to 2590 meters (5500 to 8500 feet). The dominant slopes have gradients of 10 to 80 percent. This unit is undivided to slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered steep mountain slopes, and ridge tops.

Frost shattered steep mountain slopes are formed in a thin layer of wind-deposited volcanic ash that overlies colluvium derived from Belt rocks such as quartzite, argillite, and siltite. Slope gradients range from 35 to 80 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of gravelly or cobbly loam or silt loam surface layers and stony loamy subsoils. The dominant soils are classified as Typic and Andic Cryochrepts. Rock outcrop occurs on 10 to 50 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 70 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium from quartzite, argillite, and siltite that has a thin veneer of volcanic ash loess at the surface. Slope gradients range from 10 to 30 percent. Soils on this landform are deep and well drained. These soils are poorly developed in very gravelly or stony colluvium. The dominant soils are classified as Typic and Andic Cryochrepts. Rock outcrop occurs on 10-40 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine-subalpine fir series. This component represents 30 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA74-M332C

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES AND SHALES

Location: This LTA occurs on the Lewis and Clark National Forest.

Acreage by Section

74-M332C	3,827

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of frost shattered ridges and slopes. Parent materials are residuum and colluvium underlain by sandstone shale, and other mixed sedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with stoney loamy textures. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range of this LTA is 1525 to 2074 meters (5000 to 6800 feet). The dominant slopes have gradients of 30 to 60 percent. This LTA is slightly dissected by streams, with no apparent dominant stream pattern. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in sandstone, shale and other mixed sedimentary bedrock. Slope gradients range from 25 to 60 percent. Soils on these landforms are moderately deep, weakly developed, with stoney loamy textures. These soils are classified as Lithic and Typic Cryoborolls, and Typic and Andic Cryochrepts. Rock outcrop occurs on about 10 to 30 percent of this landscape component and scree occupies an equal, and sometimes larger, area. The dominant potential natural vegetation is subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA83-M332C
LTA83-M332D

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This LTA is located on gently to moderately sloping hills in the Little Belt Mountains with minor amounts on the Rocky Mountain Front on the Lewis and Clark National Forest.

Acreage by Section

83-M332C	329
83-M332D	18,662

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a low relief hills setting, which is typically composed of old clayey deposits. Parent materials are residuum underlain by sedimentary rocks, usually sandstones and shales.

Accessory Characteristics: The primary soils are moderately deep with loamy and clayey textures. The vegetation is coniferous forest. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1676 to 2286 meters (5500 to 7500 feet). The dominant slopes have gradients of 0 to 25 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of old clayey alluvial deposits.

Old clayey alluvial deposits are formed in sandstone and shale sedimentary rocks. Slope gradients range from 0 to 25 percent. Soils on these landforms are moderately deep, strongly developed, with loamy and clayey textures. These soils are classified as Aquic Cryoboralfs. Rock outcrop generally is not found in this landscape component. The dominant potential natural vegetation is alpine fir habitat types. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA90-M332C
LTA90-M332D
LTA90-331D

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located primarily in the Little Belt and Big Snowy Mountain Ranges.

Acreage by Section

90-M332C	67,272
90-M332D	73,847
90-331D	2,576

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of valley sideslopes and benchy lower valley slopes. Parent material is shale.

Accessory Characteristics: The primary soils are deep, clayey and loamy-skeletal silt loams and silty clay loams. The vegetation is coniferous forest. Mean annual precipitation is 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1372 to 2134 meters (4500 to 7000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately dissected, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of rotational slumps and mud flows, benchy lower valley slopes, and upper valley sideslopes.

Rotational slumps and mud flows are formed in shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep, weakly developed, and consist of mainly of loam, silt loam, and cobbles. The major soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is subalpine fir series. This component represents 55 percent of this LTA.

Benchy lower valley slopes are formed in shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep and deep, weakly developed, and consist of loam, silt loam and gravel. The major soils are classified as Typic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is the Douglas-fir series. This component represents 30 percent of this LTA.

Upper valley sideslopes are formed in shale. Slope gradients range from 10 to 25 percent. Soils on these landforms shallow, moderately developed and consist mainly of loam and cobble. The major soils are classified as Mollic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir series. This component represents 15 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest

CHAPTER 8

LTA Descriptions

Section M332D Belt Mountains

This Section occurs in central Montana and generally coincides with the Central Montana Island Mountains geomorphic area previously described. Forty five LTAs were mapped in this Section. See Appendix F for a complete list of the LTAs and their acreages. Map unit descriptions are preceded by the following illustrations:

Figure 30: Map showing location of M332D within the Northern Region

Figure 31: Section M332D Moderately and Highly Weathered Granitic Mountains, landscape photograph.
Southwestern Elkhorn Mountains, Helena National Forest

Figure 32: Map showing distribution of LTAS within M332D

Figure 33: Bar chart showing abundance of landform groups within M332D

Figure 34: Bar chart showing abundance of geologic material groups within M332D

LTA10-M332Dj

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the Boulder Mountains, Beaverhead-Deerlodge National Forest, southwest Montana, in the upper Jefferson River Basin.

Acreage by Subsection

10-M332Dj	9,182

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley bottom landscape setting, which is typically composed of floodplains and terraces. Parent material is alluvium deposited on a variety of bedrock types.

Accessory Characteristics: The primary soils are deep with cobbly sandy and loamy textures. The vegetation is a mosaic of grassland, shrublands, and coniferous forest. Mean annual precipitation ranges from 36 to 51 centimeters (14 to 20 inches). The elevation range of this LTA is 1677 to 1982 meters (5500 to 6500 feet). The dominant slopes have gradients of 0 to 20 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being NA. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of floodplains, and terraces.

Floodplains are formed in coarse alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, weakly developed, with cobbly sandy and loamy textures. These soils are classified as Typic Cryochrepts and Cryaquolls, and Typic and Aquic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 60 percent of this LTA.

Terraces are formed in coarse alluvium. Slope gradients range from 0 to 20 percent. Soils on these landforms are deep, weakly developed, with cobbly sandy and loamy textures. These soils are classified as Typic Cryoboralfs, Cryochrepts, and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir and subalpine fir series. This component represents 40 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

**LTA10-M332D
LTA10-M332C
LTA10-331D**

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in all mountain ranges of the Lewis and Clark and Helena National Forests.

Acreage by Section

10-M332D	77,706 (Section except for M332Dj)
10-M332C	17,094
10-331D	982

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley bottom landscape setting which is usually composed of stream terraces, floodplains, and alluvial fans. Parent materials are stratified alluvial deposits of sands, silts and gravels.

Accessory Characteristics: The primary soils are deep gravelly to extremely gravelly sandy loams and loams. The vegetation is a mosaic of deciduous forest, coniferous forest, well drained grassland and wet meadow. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1159 to 1983 meters (3800 to 6500 feet). The dominant slopes are 0 to 4 percent. This LTA by nature has very high stream densities. Wetlands are an important component of this LTA.

LTA Components: This landtype association consists of floodplains, and stream terraces/and alluvial fans.

Floodplains and lower terraces are formed in a variety of stratified alluvium. These floodplains have slope gradients that range from 0 to 2 percent. Soils on these landforms are very deep, poorly developed, and consist mainly of sand, gravel and cobble. Silts and clays are found to a lesser extent in oxbow positions and areas historically occupied by beaver dams. The major soils are highly variable and include Fluvents, Aquepts, Aquolls and Borolls. The dominant potential natural vegetation is Englemann spruce and subalpine fir series, with inclusions of black cottonwood. This component represents 60 percent of this LTA.

Higher terraces and included fans are formed in alluvium. These terraces have slope gradients that range from 0 to 4 percent. The alluvial fans often have slope gradients of 8 to 25 percent. Soils on these landforms are deep, poorly to well developed, and consist mainly of gravelly to extremely gravelly sandy loams and loams. Sand, gravel and/or cobble layers or lenses are often present. Areas of silt and clay are present in old oxbow and beaver dam locations as well as glacial ice dams. The major soils are classified as Haploborolls and Cryoborolls. The dominant potential natural vegetation is Douglas-fir, rough fescue, and big sagebrush series. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena and Lewis and Clark National Forests

LTA12-M332D

VALLEYS:ALLUVIAL FANS, GLACIAL TERRACES COARSE ALLUVIAL AND GLACIOFLUVIAL DEPOSITS

Location: This LTA is located in foothills near the Boulder, Highland, and Tobacco Root Mountains on the Beaverhead-Deerlodge National Forest in southwest Montana. It occurs in the upper Boulder and Jefferson River basins.

Acreage by Subsection

12-M332D	60,591	(Section except M332Db)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley landscape setting, which is typically composed of alluvial fans and glacial terraces. Parent materials are coarse alluvium and glacial outwash over undifferentiated bedrock.

Accessory Characteristics: The primary soils are deep with cobbly and gravelly sandy and loamy textures. The vegetation is a mosaic of shrublands and grasslands with minor inclusions of coniferous forest. Mean annual precipitation ranges from 23 to 46 centimeters (9 to 18 inches). The elevation range of this LTA is 1373 to 1951 meters (4500 to 6400 feet). The dominant slopes have gradients of 5 to 15 percent. This LTA is moderately to highly dissected by intermittent streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of two landform components: alluvial fans and glacial terraces.

Alluvial fans are formed in coarse alluvial and glaciofluvial deposits originating from a variety of bedrock types. The majority of this LTA consists of a series of coalescing alluvial fans. Slope gradients range from 1 to 15 percent. Soils on these landforms are moderately deep to deep, are weakly to moderately developed; and have cobbly and gravelly sandy loam and loam surface soils. The subsurface layers are cobbly sandy loams and loams in the less developed soils and cobbly sandy clay loams and clay loams where subsoil clay accumulation occurs. These soils are classified as Ustochrepts, Argiborolls, and Haploborolls. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is needle-and-thread/bluegrama; bluebunch wheatgrass/blue grama, and sagebrush/bluebunch wheatgrass habitat types. This component represents 95 percent of this LTA.

Glacial terraces are formed in coarse glaciofluvial deposits. This component is represented by one mapping unit at the mouth of Rock Creek in the upper Boulder River. Slope gradients range from 0 to 20 percent. Soils on this landform are deep, weakly to moderately developed; with cobbly sandy and loamy textures. They are classified as Typic Cryochrepts and Cryoboralfs, and Argic and Typic Cryoborolls. Rock outcrop does not occur in this landform component. The dominant potential natural vegetation is amosiac of Douglas fir/twinflower; dwarf huckleberry/pinegrass; sagebrush/rough fescue or rough fescue/Idaho fescue habitat types. This component represents 5 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA12-M332Db
LTA12-M331A

**VALLEYS: OUTWASH AND OTHER OLDER COARSE
ALLUVIAL DEPOSITS**

Location: This unit is located mostly in the Beartooth, Madison and southern Gallatin mountain ranges in southwestern Montana with some delineations in the Bridger and Crazy Mountains.

Acreage by Subsection

12-M332Db	8,115
12-M331A	59,997

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently sloping glacial outwash plains, alluvial fans, and terraces with some landflows. Parent material is coarse textured glaciofluvial deposits with some mixed loess (wind blown silt) in the soils' surface layer.

Accessory Characteristics: Vegetation is dense lodgepole pine forest, scattered Douglas-fir forest, or mountain grassland. Elevation ranges from 1560 to 2438 meters (5200 to 8000 feet). Mean annual precipitation is 38 to 81 centimeters (15 to 32 inches). Slopes range from 0 to 40 percent.

LTA Components: This LTA has two components depending upon the vegetation.

Where vegetation is grassland, soils are Typic and Aridic Argiborolls with some carbonatic soils such as Typic Cryoborolls, Calcic Cryoborolls, and Ustollic Haplargids. These soils are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Common potential vegetation is big sagebrush and Idaho fescue series. This component makes up 40 percent of the LTA.

Where vegetation is lodgepole pine forest or Douglas-fir forest, soils are Typic Cryochrepts or Typic Cryoboralfs. These soils are moderately coarse to medium textured, rocky, and have very low to moderate fertility and water holding capacity. A common potential vegetation is lodgepole pine near Hebgen Lake in the Gallatin Range. This component makes up 60 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

LTA14-M332D

VALLEYS: FINE ALLUVIUM

Location: This LTA is located in the Whitetail Creek valley on the Beaverhead-Deerlodge National Forest in southwest Montana. It occurs in the Upper Jefferson River basin.

Acreage by Section

14-M332D	2,606

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in large valley bottoms which are typically composed of flood plains and terraces. Parent materials are recent alluvium.

Accessory Characteristics: The primary soils are deep with fine textures, some with organic layers on and near the surface. The vegetation is a mosaic of meadows and riparian shrubs, and deciduous tree species. Mean annual precipitation is about 25 cms. (10 inches). The elevation range is 1310 to 1400 meters (4300 to 4600 feet). The dominant slopes have gradients of 0 to 10 percent. This LTA is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of two landform components: flood plains and terraces.

Flood plains are formed in variable alluvium, typically finer and/or organic near the surface. Slope gradients vary from 0 to 5 percent. Soils on these landforms are deep, weakly to moderately developed, poorly drained sands and silts, often with organic layers. Dominant soils are classified as Aquolls and Borolls. The potential natural vegetation is a variety of riparian communities and habitat types. This component represents about 50 percent of this LTA.

Terraces are formed in fine alluvium. Slope gradients range from 2 to 10 percent. Soils on this landform are deep, somewhat poorly to well drained, and moderately developed. They are classified as Argiborolls and Ustochrepts. The dominant vegetation is a variety of dry and moistgrass and shrub habitat types with significant areas converted to pastures and irrigated hay meadows. This component represents about 50 percent of this unit.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA20-M332D

BREAKS: METASEDIMENTARY (BELT)

Location: This LTA is located in the Missouri River Basin in the Big Belt, Elkhorn, and Alice Nevada Mountains.

Acreage by Section

20-M332D	13,713

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a very steep, deeply eroded or faulted mountainous landscape setting, which is typically composed of structural breaks. Parent materials are colluvium and residuum underlain by metasedimentary (mainly argillite, siltite and quartzite) and volcanic bedrock (basalts and andesites). They are medium textured with high rock contents throughout.

Accessory Characteristics: The primary soils are shallow and moderately deep. The vegetation is a mosaic of coniferous forest and forested scree, with substantial rock outcrops. Mean annual precipitation ranges from 25 to 75 centimeters (10 to 30 inches). The elevation range of this LTA is 1220 to 2288 meters (4000 to 7500 feet). The dominant slopes have gradients of 60 to 90 percent. This LTA is highly to slightly dissected (closely to widely spaced drainages) and weakly or moderately incised by streams, with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of structural breaks.

Structural breaks are formed in colluvium and residuum. Slope gradients range from 60 to 90 percent. Soils on these landforms are shallow and moderately deep, weakly developed and are loams with high amounts of pebbles and channers throughout. These soils are classified as Lithic Ustochrepts, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation series are Douglas-fir, subalpine fir, and limber pine on warmer aspects with subalpine fir and Douglas-fir on more northerly aspects. This component represents 100 percent of this LTA.

Compiled by: Larry Laing. Helena National Forest

LTA21-M332D
LTA21-M332E

BREAKS: HIGHLY WEATHERED GRANITICS

Location: This LTA is located in the Anaconda-Pintlar, Fleecer, Pioneer, Boulder, Bull, Highland, and Tobacco Root Mountains on the Beaverhead /Deerlodge National Forest in the Jefferson and Madison River Basins in southwest Montana.

Acreage by Section

21-M332D	8,423
21-M332E	41,402

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum derived from moderately to highly weathered Cretaceous to Tertiary intrusive rocks undifferentiated, consisting mainly of granite, quartz monzonite, and granodiorite.

Accessory Characteristics: The primary soils are shallow to moderately deep, well drained, gravelly sandy loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 3048 meters (6600 to 10000 feet). The dominant slopes have gradients of 40 to 75 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic to parallel.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 40 to 75 percent. Soils on these landforms are shallow to moderately deep, weakly developed, well drained, channery sandy loams and loams. These soils are classified as Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop accounts for up to a quarter of this landscape component. The dominant potential natural vegetation is Douglas-fir, big sagebrush, subalpine fir and whitebark pine series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda and Dave Ruppert, Beaverhead-DeerLodge National Forest

LTA24-M332D

BREAKS: VOLCANICS

Location: This LTA is located in the Boulder Mountains of southwest Montana in the Jefferson River basin. It occurs mostly on the Beaverhead-Deerlodge National Forest.

Acreage by Section

24-M332D	4,485

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream breaks. Parent materials are residuum underlain by volcanic bedrock.

Accessory characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of grasslands, shrublands, coniferous forest, and rock. Mean annual precipitation ranges from 41 to 51 centimeters (16 to 20 inches). The elevation range of this LTA is 1677 to 2134 meters (5500 to 7000 feet). The dominant slopes have gradients of 45 to 80 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream breaks.

Stream breaks are formed in volcanic bedrock. Slope gradients range from 45 to 80 percent. Soils on these landforms are shallow and moderately deep, weakly developed, and have cobbly loamy textures. These soils are classified as Typic and Lithic Cryochrepts and Cryorthents. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation is forested scree, Idaho fescue, sagebrush, and Douglas-fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA25-M332D
LTA25-M331A

BREAKS: SANDSTONES AND SHALES

Location: This unit is located in the Beartooth, Bridger, Crazy, Gallatin and Madison mountain ranges in southwestern Montana.

Acreage by Section

25-M332D	20,570
25-M331A	69,798

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep to moderately steep ridges and slopes whose shape is controlled by underlying bedrock structure. Soil parent material is colluvium and residuum derived from thickly interbedded limestone, sandstone, and shale.

Accessory Characteristics: Vegetation is sparse to dense forest with some meadows and grassland. Elevation ranges from 1830 to 2640 meters (6000 to 8800 feet). Mean annual precipitation is 58 to 127 cms. (23 to 50 inches). Slopes are greater than 40 percent.

LTA Components: This landtype association consists of two components.

Where vegetation is sparse Douglas-fir forest and grasslands, soils are Argic Cryoborolls, and Mollic Cryoboralfs. These soils are medium to moderately fine textured, rocky or non-rocky, with moderate to high fertility and water holding capacity. Where bedrock is limestone, soils are Lithic and Typic Calciborolls, and Calcic Cryoborolls. Rock outcrop makes up 10 to 25 percent of this component. Common potential vegetation includes Douglas-fir, Idaho fescue, and big sagebrush series. This component makes up 50 percent of this LTA.

Where vegetation is dense forest and meadows, soils are Mollic and Typic Cryoboralfs, Typic Cryochrepts, and Argic Cryoborolls. These soils are medium to moderately fine textured, rocky or non-rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up 10 to 25 percent of this component. Common potential vegetation includes Douglas-fir, subalpine fir, Idaho fescue and subalpine fir-whitebark pine series. This component makes up 50 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest and John R. Lane, Custer National Forest

LTA27-M332D

BREAKS: CARBONATES

Location: This LTA is located in the Big Belt, Little Belt, and Snowy Mountains in the Missouri River basin.

Acreage by Section

27-M332D	235,563

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a very steep, deeply eroded or faulted mountainous landscape setting, which is typically composed of structural breaks. Parent materials are colluvium and residuum underlain by limestone.

Accessory Characteristics: The primary soils are moderately deep or deeper. They are medium textured with high rock contents throughout. The vegetation is a mosaic of coniferous forest and forested scree, with substantial rock outcrops. Mean annual precipitation ranges from 25 to 75 centimeters (10 to 30 inches). The elevation range of this LTA is 1159 to 2288 meters (3800 to 7500 feet). The dominant slopes have gradients of 60 to 90 percent. This LTA is highly to slightly dissected (closely to widely spaced drainages) and weakly or moderately incised by streams, with the dominant stream patterns being subparallel.

LTA Components: This landtype association consists of structural breaks.

Structural breaks are formed in colluvium and residuum. Slope gradients range from 60 to 90 percent. Soils on these landforms are mostly moderately deep or deeper to bedrock, weakly developed and are loams dominated by gravel size rock fragments throughout. These soils are classified as Typic Ustochrepts and Typic Cryochrepts. Rock outcrop and associated talus occurs on about 40 to 50 percent or more over much of this landscape component. The amount of rock outcrop and scree is around 20 percent or less. The dominant potential natural vegetation is Douglas-fir series on higher energy aspects and subalpine fir and spruce series on more northerly aspects. Forested and nonforested scree occur throughout. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA34-M332Dj
LTA34-M332De

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Blackfoot River Drainage.

Acreage by Subsection

34-M332Dj	2,786
34-M332De	10,644

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting which is typically composed of steep mountain slopes. Parent material is colluvium and residuum underlain by weakly weathered andesite and other volcanic rocks. In some areas the parent material is influenced by a complex of volcanic and metasedimentary Belt Series rocks.

Accessory Characteristics: The primary soils are moderately deep or deeper and are medium to moderately fine textured. The vegetation is coniferous forest. Mean annual precipitation ranges from 50 to 75 centimeters (20 to 30 inches). The elevation range of this LTA is 1464 to 2135 meters (4800 to 7000 feet). The dominant slopes have gradients of 25 to 60 percent. This LTA is moderately dissected (moderately to widely spaced drainages) and deeply incised by streams, with the dominant stream pattern being dendritic. Small wetlands are sometimes associated with slumpy areas.

LTA Components: This landtype association consists of steep, mountain slopes.

Steep mountain slopes are mostly formed in andesite and other volcanic rock. In some areas they are influenced by a complex of volcanic and metasedimentary Belt Series rocks. Slope gradients range from 25 to 60 percent. Soils on these landforms are moderately deep to very deep, moderately developed, and have very gravelly or gravelly loam, cobbly loam and stony loam surfaces. Subsurface textures include very and extremely stony clay loam, very and extremely cobbly loams, very gravelly clay loam and extremely gravelly loam. These soils are classified as Typic Cryoboralfs, Typic Eutroboralfs and Typic Agriborolls. Rock outcrop occurs on less than 5 percent of this landscape component. Small landslides are associated with basaltic and andesitic dikes and sills or local ash/tuff deposits. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA34-M332Db
LTA34-M332C
LTA34-331D

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Highwood, Little Belt, and Crazy Mountains.

Acreage by Section

34-M332Db	1,277
34-M332C	233
34-331D	6,622

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep mountain slopes composed of convex ridges and shoulders in complex with smooth surfaces. Parent material is sandstone, granite, and basalt.

Accessory Characteristics: The primary soil is shallow to moderately deep very gravelly or stony loam or sandy loam. The vegetation is coniferous forest. Mean annual precipitation ranges from 46 to 76 centimeters (18 to 30 inches). The elevation range is 1830 to 2288 meters (6,000 to 7,500 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of very steep mountain slopes.

These mountain slopes are formed in sandstone, granite and basalt. Slope gradient is greater than 60 percent. Soil on this landform is shallow to moderately deep, weakly developed and consists mainly of very gravelly or stony colluvial material. These soils are classified as Typic Cryochrepts. Typically 10 to 25 percent of this association consists of rock outcrop. The dominant potential vegetation is subalpine fir series with some scree. This component represents the entirety of this LTA.

Compiled by: Rich Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena/Lewis and Clark National Forests

LTA36-M332D
LTA36-M332C
LTA36-331D

HIGH RELIEF MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Lewis and Clark National Forest except in the Little Snowy Mountains.

Acreage by Section

36-M332D	12,477
36-M332C	13,447
36-331D	764

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep unglaciated mountain slopes typically composed of convex ridges and shoulders in complex with smooth surfaces. Parent materials are non-carbonate and sedimentary.

Accessory Characteristics: The primary soils are shallow to moderately deep extremely gravelly loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). The elevation range of this LTA is 1829 to 2743 meters (6000 to 9000 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being radial. Wetlands and lakes are virtually non-existent in this LTA.

LTA Components: This landtype association consists of convex ridges, and shoulders in complex with smooth surfaces. All of these landforms occur on non-carbonate sedimentary parent material.

The convex ridges and shoulders have slope gradient of 25 to greater than 60 percent. Soils on these landforms are shallow to moderately deep, poorly developed, and consist mainly of extremely gravelly sandy loam. The major soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on 75 percent of this unit. The dominant potential natural vegetation series is subalpine fir-whitebark pine.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA37-M332D

HIGH RELIEF MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located in the Big Belt, Dry Range and South Elkhorn Mountains, part of the Missouri River basin.

Acreage by Section

37-M332D	46,970

LTA Settings and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and dipslopes. Parent materials are colluvium and residuum underlain by limestone sometimes associated with calcareous shales.

Accessory Characteristics: The primary soils are moderately deep and shallow and have medium textured surfaces. The vegetation is coniferous forest with inclusions of mountain grassland. Mean annual precipitation ranges from 38 to 76 centimeters (15 to 30 inches). The elevation range of this LTA is 1068 to 2196 meters (3500 to 7200 feet). The dominant slopes have gradients of 40 to 60 percent. This LTA is highly to slightly (widely to closely spaced drainages) and has weakly to deeply incised drainages. The dominant stream patterns are dendritic and subparallel.

LTA Components: This landtype association consists of mountain slopes, and dipslopes.

Mountain slopes are formed in colluvium and residuum from limestone sometimes with included calcareous shales and argillites. Slope gradients range from 40 to 60 percent. Soils on these landforms are moderately deep and shallow and weakly developed, although some soils have thick dark surface layers. Surface textures are very gravelly loams and gravelly, very gravelly and extremely gravelly silt loams. Subsurface layers have extremely gravelly loam, extremely gravelly silt loam, very gravelly silt loam, very gravelly loam and very, gravelly silty clay loam textures. These soils are classified as Typic and Lithic Ustochrepts, Typic Cryochrepts, Typic Calciborolls, Calcic Cryoborolls and Lithic Ustochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir with ponderosa pine at lower elevations on some steep southerly aspects. Subalpine fir and spruce can occur on northerly aspects at higher elevations. This component represents 76 percent of this LTA.

Dip slopes are formed in colluvium and residuum formed in limestone and calcareous sandstone. Slope gradients range from 40 to 60 percent. Soils on these landforms are moderately deep and shallow and are weakly developed. Surface soils have extremely gravelly silt loam and gravelly silty clay loam textures. The subsurface layers are typically very gravelly silty clay loam and very gravelly silt loam. These soils are classified as Typic and Lithic Cryochrepts. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir. This component represents 24 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA39-M332D

STEEP GLACIATED MOUNTAIN SLOPES: GNEISSES AND SCHISTS

Location: This LTA is located in the Little Belt Mountains of the Lewis and Clark National Forest in west-central Montana in the Missouri River Basin.

Acreage by Section

39-M332D	5,300

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a steep mountain landscape setting, which is typically composed of rockland and scree. Parent materials are residuum underlain by gneiss and schist bedrock.

Accessory Characteristics: Soils are weakly developed in very stoney colluvium. Active movement of loose rock is common. The vegetation is a mosaic of rock outcrop, scree, and coniferous forest. Mean annual precipitation ranges from 64 to 89 centimeters (25 to 35 inches). The elevation range of this LTA is 1829 to 2286 meters (6000 to 7500 feet). The dominant slopes have gradients over 60 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of steep mountain slopes.

Mountain slopes are formed in gneiss and schist bedrock. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with stoney textures. These soils are classified as Typic Cryochrepts. Rock outcrop and scree occur on 40 to 90 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and scree. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest.

LTA40-M332D

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the Big Belt Mountains of the Upper Missouri River Basin of west central Montana.

Acreage by Section

40-M332D	7,828

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a steep, alpine glaciated landscape setting. Parent materials are metasediments composed of argillites, siltites and quartzites with alpine glacial till scattered throughout, which is typically medium textured.

Accessory Characteristics: The primary soils are shallow to moderately deep. They are moderately coarse to medium textured. The vegetation is a mosaic of coniferous forest, avalanche chutes, and rock outcrops. Mean annual precipitation ranges from 50 to 113 centimeters (20 to 45 inches). The elevation range of this unit is 1846 to 2923 meters (6000 to 9500 feet). The dominant slopes have gradients greater than 60 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wet sidehill areas are a major component of this unit.

LTA Components: This landtype association consists of steep glaciated mountain slopes.

Steep glaciated mountain slopes are formed in metasediments that consist of argillites, siltites and quartzites. The primary landforms include glacial cirque basins and headwalls and glacial trough walls. They have been strongly scoured and often contain shallow soils and rock outcrops. The lower slopes can have glacial till depositions. Slopes range from 25 to 100 percent, but the dominant slopes are greater than 60 percent. The major soils are classified as Andic Cryochrepts in the cirque basins. The dominant potential natural vegetation in the cirques is subalpine fir and whitebark pine /subalpine fir habitat types. The major soils associated with the glacial trough walls include Typic Ustochrepts, Andic Cryochrepts and Typic Cryoboralfs. Rock outcrops also occur. The dominant potential natural vegetation on the trough walls is Douglas-fir and subalpine fir series as well as forested scree. The soils and vegetation associated with these extremely steep slopes are strongly controlled by aspect.

Compiled by: Larry Laing, Helena National Forest

LTA41-M332Dc
LTA41-M331A

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Gallatin and Crazy mountain ranges in southwestern Montana.

Acreage by Section

41-M332Dc	72,095
41-M331A	117,173

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of steep glacial troughwalls with weak stream dissection. Included are some talus slopes and rock glaciers. Soil parent material is colluvium and glacial till derived from coarse grained, shallow intrusive rocks.

Accessory Characteristics: Vegetation is sparse to dense upper subalpine, lower subalpine, or Douglas-fir forest. Slopes are greater than 40 percent. Elevation ranges from 1768 to 2743 meters (5800 to 9000 feet). Mean annual precipitation is 63 to greater than 125 centimeters (25 to greater than 50 inches).

LTA Components: This LTA has two components:

Soils where vegetation is either Douglas-fir or lower subalpine forest are Udic Ustochrepts or Dystric Cryochrepts. These soils are deep, moderately coarse to coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 to 30 percent of this component. Common potential vegetation includes the subalpine fir and Douglas-fir series. This component makes up 35 percent of this LTA.

Soils where vegetation is sparse upper subalpine forest or nearly absent are Cryochrepts. They are deep to shallow, and generally coarse textured with very low fertility and water holding capacity. Rock outcrop makes up 50 to 90 percent of this component. Where forested, a common potential vegetation is the subalpine fir-whitebark pine series. This component makes up 65 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA41-M332D

STEEP GLACIATED MOUNTAIN SLOPES: GRANITIC

Location: This LTA is located in the Big Belt Mountains, the upper Ten Mile Creek drainage and the Elkhorn Mountains.

Acreage by Section

41-M332D 28,251 (Section except M332Dc)

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an alpine glaciated mountainous landscape setting which is typically composed of glacial trough walls. Parent material is glacial till underlain by weakly weathered granite, granite-diorite and diorites. Northerly aspects have volcanic ash influenced surface soils.

Accessory Characteristics: The primary soils are deep and moderately coarse textured. The vegetation is a mosaic of coniferous forest and forested scree. Mean annual precipitation ranges from 50 to 100 centimeters (20 to 40 inches). The elevation range of this LTA is 1678 to 2501 meters (5500 to 8200 feet). The dominant slopes have gradients of 60 to 90 percent. This LTA is highly dissected (closely spaced drainages) and weakly incised by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of glacial trough walls.

Glacial trough walls are formed in weakly weathered granite or granitelike rock. Slope gradients range from 60 to 90 percent. Soils on these landforms are deep, weakly developed, and have sandy loam or loam surfaces and very to extremely gravelly sandy loam subsurface. These soils are classified as Typic Ustochrepts and Typic Cryochrepts. Rock outcrop occurs on about 40 percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir with subalpine fir on some north facing slopes. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA42-M332D

STEEP GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Elkhorn Mountains in southwest Montana.

Acreage by Section

42-M332D	23,865

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of cirques. Parent materials are residuum underlain by volcanic bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 64 to 76 centimeters (25 to 30 inches). The elevation range of this LTA is 2134 to 2896 meters (7000 to 9500 feet). The dominant slopes have gradients of 60 to 100 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of cirques.

Cirques are formed in volcanic bedrock. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Cryorthents and Cryochrepts. Rock outcrop occurs on about 50 to 90 percent of this landscape component. The dominant potential natural vegetation is subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA43-M332D
LTA43-M332C
LTA43-M333C
LTA43-331D

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located mostly on the Rocky Mountain Front and in adjacent areas.

Acreage by Section

43-M332D	12,878
43-M332C	158,089
43-M333C	235
43-331D	625

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically occupied by fault escarpments (especially in M332C), cirques, troughwalls, and ridges. The parent material is limestone.

Accessory Characteristics: The primary soils are Lithic Cryorthents and Cryochrepts. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). The dominant slope gradients are 70 to 90 percent. This LTA is moderately dissected by streams and the dominant drainage pattern is dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of steep west facing slopes, very steep glacial breaks, and rockland/scree on fault escarpments.

The steep west facing slopes are formed in limestone. These slopes have gradient ranging from 40 to 60 percent. Soils on these landscapes are shallow, poorly developed, and consist mainly of loam and flaggy gravel. These soils are classified as Lithic Cryorthents. Rock outcrop occurs on less than 15 percent of this landscape component. The dominant potential vegetation series are open growing wind deformed Douglas-fir, limber pine, and spruce on scree. This component represents 30 percent of this LTA.

The very steep glacial breaks are formed in limestone. Slope gradients are mainly greater than 60 percent. The soil on this landscape is deep, poorly developed, and consist mainly of sandy-loam and gravel. These soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on seventy-five percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir. This component represents 30 percent of this LTA.

The rockland/scree component of this LTA occur on fault escarpments in limestone. Slopes are mainly greater than 60 percent. Soil on this landscape consists of sandy loam, loamy sand, gravel, and cobble. These materials are classified as scree. The dominant potential vegetation is subalpine fir-whitebark pine. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA44-M332D
LTA44-M332C
LTA44-331D

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is extensive throughout the Rocky Mountain Division on the Lewis and Clark Forest and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

44-M332D	15,947
44-M332C	101,583
44-331D	98

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically composed of glacial cirque headwalls, and rockland and scree on fault escarpments in Section M332C, and glacial cirques in Section M332D. The parent material is sandstone and/or shale.

Accessory Characteristics: The primary soils are deep extremely cobbly sandy loams and loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1500 to 2896 meters (5000 to 9000 feet). The dominant slopes have gradients of 40 to greater than 60 percent. This landtype is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of glacial cirques, rockland, and scree on fault escarpments.

Glacial cirques are formed in sandstone and shale. Soils on these landforms are from very shallow to moderately deep, poorly developed, and consist mainly of sandy loam and angular cobble. The major soils are classified as Typic, Andic and Lithic Cryochrepts. Rock outcrop occurs on 5 to 15 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine series. This component represents 60 percent of this unit.

Rockland occurs on a variety of non-carbonate rocks. This component is a miscellaneous landtype and is classified as a scree habitat type. It does support some alpine fir and whitebark pine. This component represents 25 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest, and Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA50-M332D

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This unit is located in the Big Belt Mountains of the Upper Missouri River basin of west central Montana.

Acreage by Section

50-M332D	5,840

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on gently to moderately sloping glacial landscape settings. Parent materials are undifferentiated glacial drift composed of argillites, siltites and quartzites. Small areas of residual materials and rock outcrop are also included. They are medium textured.

Accessory Characteristics: The primary soils are deep, moderately coarse to medium textured. The vegetation is, typically, a mosaic of coniferous forest with some wetlands. Mean annual precipitation ranges from 50 to 88 centimeters (20 to 35 inches). The elevation range of this unit is 1846 to 2461 meters (6000 to 8000 feet). The dominant slopes range from 10 to 40 percent. This map unit is slightly dissected by streams, with the dominant stream patterns being deranged and dendritic. Wetlands, seeps, bogs and riparian zones are common components of this unit.

LTA Components: This landtype association consists of gently to moderately sloping glacial moraines and glaciated mountain slopes.

Gently to moderately sloping glacial moraines are formed in the undifferentiated belt materials, both till and outwash. The moderately sloping glaciated mountain topography is covered with till. These areas have slopes that range from 10 to 40 percent. They have moderately coarse to medium textured materials. The major soils are classified as Typic Cryochrepts and Typic Cryoboralfs. They often have volcanic ash influence at higher elevations. The dominant potential natural vegetation is subalpine fir and Douglas-fir.

Compiled by: Larry Laing, Helena National Forest

LTA51-M332Dh
LTA51-M332Dj

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This LTA is located in the Boulder, Big Belt, and Elkhorn Mountains; Beaverhead-Deerlodge and Helena National Forests, southwest Montana, in the upper Jefferson and Missouri River Basins.

Acreage by Subsection

51-M332Dh	10,705
51-M332Dj	45,854

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of glaciated mountain slopes, ridges, and moraines. Parent materials are residuum and granitic glacial moraine underlain by weathered granitic bedrock. The surface mineral horizon is often influenced by wind blown volcanic ash.

Accessory Characteristics: The primary soils are shallow, moderately deep, and deep with gravelly, cobbly and bouldery; sandy and loamy textures. The vegetation is a mosaic of meadows and coniferous forest. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1678 to 2591 meters (5500 to 8500 feet). The dominant slopes have gradients of 20 to 50 percent. This LTA is highly dissected by streams. The dominant stream pattern is rectangular with a deranged pattern locally in glacial moraines. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of glaciated mountain slopes and ridges, and glacial moraines.

Glaciated mountain slopes and ridges are formed in weathered granitic bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with gravelly sandy and loamy textures. These soils are classified as Typic and Lithic Cryochrepts and Cryorthents with local areas of Typic Cryoboralfs. Rock outcrop occurs on about 25 percent of this landscape component. The dominant potential natural vegetation is subalpine fir series. This component represents 50 percent of this LTA.

Moraines are formed in granitic glacial deposits. Slope gradients range from 0 to 35 percent. Soils on these landforms are deep, moderately developed, with cobbly and bouldery loamy textures. Some areas have a surface mineral layer with wind blown volcanic ash influence. These soils are classified as Typic and Aquic Cryochrepts and Cryoboralfs. Rock outcrop is not associated with this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. Small meadows scattered throughout the area contain Typic and Aquic Cryoborolls, and Typic Cryaquolls with willow, sedge and hairgrass series. The moraine component represents 50 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest and Larry Laing, Helena National Forest.

LTA51-M332D
LTA51-M332E
LTA51-M331A

GLACIATED MOUNTAIN SLOPES: HARD INTRUSIVE ROCKS

Location: This unit is located in the Gallatin, Madison, Crazy and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section

51-M332D	42,250	(Section except M332Dh,M332Dj)
51-M332E	125,884	
51-M331A	760	

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently to moderately steep glacial moraine. Soil parent material is glacial till derived from coarse grained, shallow intrusive rocks.

Accessory Characteristics: Vegetation is sparse to dense upper to lower subalpine forest, Douglas-fir forest, or mountain grassland. Elevation ranges from 1981 to 2743 meters (6500 to 9000 feet). Mean annual precipitation is from 50 to over 125 centimeters (20 to greater than 50 inches). Slope gradient ranges from 0 to 40 percent.

LTA Components: This landtype association consists of three components.

Where vegetation is grassland, soils are Typic Cryoborolls and Argic Cryoborolls. These soils are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. Common potential natural vegetation is big sagebrush and Douglas-fir series. This component makes up 15 percent of the LTA.

Where vegetation is lower subalpine forest with some Douglas-fir forest, soils are Typic Cryochrepts. These soils are moderately coarse texture, rock, and have low fertility and water holding capacity. Rock outcrop makes up 10 percent of this component. Common potential natural vegetation is subalpine fir with some Douglas-fir. This component makes up 50 percent of the LTA.

Where vegetation is upper subalpine forest, soils are Cryochrepts intermixed with some Cryumbrepts. These soils are deep to moderately shallow, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 to 40 percent of this component. Common potential natural vegetation includes subalpine fir, spruce and Idaho fescue series. This component makes up 35 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA53-M332D
LTA53-M332C

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Lewis and Clark Forest.

Acreage by Section

53-M332D	10,191
53-M332C	165,005

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on an alpine glacial till landform which is typically composed of outwash benches, drift plastered trough walls, and hilly valley bottoms. Parent materials are sandstones and shales.

Accessory Characteristics: The primary soils are deep, very cobbly loams. The vegetation is subalpine forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1524 to 1981 meters (5000 to 6500 feet). The dominant slopes have gradients of 10 to 40 percent. This landtype is moderately dissected by streams with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of clayey glacial drift deposits, drift plastered trough walls, hilly valley bottoms, and hilly glaciated valleys.

The clayey glacial drift deposits are formed mainly in sandstone and shale material. Slope gradients range from 25 to 40 percent. The soils on these landforms are deep, weakly developed, loamy-skeletal loams. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation series is subalpine fir.

The drift plastered trough walls are formed mainly in sandstone and shale material. Slope gradients range from 25 to 40 percent. The soils on these landforms are deep, weakly developed, and loamy-skeletal. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation series is Douglas-fir.

The hilly valley bottoms are formed mainly in sandstone and shale. Slope gradients range from 10 to 25 percent. The soils on these landforms are moderately deep, weakly developed, and loamy-skeletal. These soils are classified as Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape. The dominant natural vegetation series is Douglas-fir.

The hilly glaciated valleys are formed mainly in sandstone and shale. Slope gradients range from 10 to 25 percent. The soils on these landforms are moderately deep, weakly developed, clay loams with 35 to 50 percent gravel. These soils are classified as Argic Cryoborolls. Rock outcrop occurs on less than 5 percent of this LTA. The dominant natural vegetation series is rough fescue.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA54-M332D
LTA54-M332E

GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in southwest Montana in the Boulder Mountains in the upper Jefferson River and upper Clark Fork River basins. It occurs on the Beaverhead-Deerlodge National Forest and the Helena National Forest.

Acreage by Subsection

54-M332D	45,449
54-M332E	31,160

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of glaciated mountain slopes and moraines. Parent materials are glacial deposits and residuum underlain by volcanic bedrock.

Accessory Characteristics: The primary soils range from very deep to shallow to bedrock. They are loamy with high cobble contents especially in the subsurface layers. The vegetation is a mosaic of coniferous forest and wet meadows with the forest dominating. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1677 to 2591 meters (5500 to 8500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is highly dissected by streams, with the dominant stream patterns being parallel or dendritic on sideslopes with a deranged pattern locally in glacial moraines. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of moraines and glaciated mountain slopes.

Moraines are formed in volcanic glacial deposits. Volcanic ash affected loess deposits often influence surface soil characteristics. Slope gradients range from 0 to 35 percent. Soils on these landforms are very deep, moderately developed, with cobbly loam, very cobbly loam and clay loam surface textures. Very cobbly loams typify subsurface textures. These soils are classified as Typic and Aquic Cryochrepts and Cryoboralfs. Rock outcrop does not occur in this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. Meadows in this component have soils classified as Typic and Aquic Cryoborolls, and Typic Cryaquolls with willow, sedge, and tufted hairgrass series. This component represents 70 percent of this LTA.

Glaciated mountain slopes are formed in volcanic bedrock. Volcanic ash affected loess deposits often influence surface soil characteristics. Slope gradients range from 20 to 50 percent. Soils on these landforms are typically shallow to moderately deep, weakly to moderately developed with cobbly loam or loam surface textures. The subsurface layers are very or extremely cobbly loams. These soils are classified as Typic and Lithic Cryochrepts and Typic Cryoboralfs. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is subalpine fir series. This component represents 30 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA57-M332D
LTA57-M331A

GLACIATED MOUNTAIN SLOPES: GNEISSES AND SCHISTS

Location: This LTA is located mostly in the Beartooth Mountains of southwest Montana. A very small acreage occurs in the Bridger Range.

Acreage by Section

57-M332D	569
57-M331A	177,582

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a glaciated mountain landscape setting, which is typically composed of moraines. Parent materials are very bouldery glacial till underlain by gneiss and schist bedrock. In the Bridger Range this unit consists mostly of weakly metamorphosed granite.

Accessory Characteristics: The primary soils are deep, with very bouldery medium to moderately coarse textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 55 to 114 cms. (22 to 50 inches). The elevation range is 1675 to 2743 meters (5500 to 9000 feet). The dominant slopes have gradients of 0 to 80 percent.

LTA Components: This landtype association consists of ground moraines in grassland, ground moraine in forest, and lateral moraines.

Ground moraines are formed in glacial till developed from gneiss and schist material. Slope gradients range from 5 to 20 percent. Forested soils on these landforms are shallow to deep, weakly developed, and very bouldery medium to moderately coarse textured. These soils are classified as Typic Cryumbrepts, Typic Cryochrepts, Typic Cryofluvents, and Lithic Cryorthents. The dominant potential natural vegetation is Douglas-fir, limber pine and subalpine fir. This component represents 70 percent of this unit.

Ground moraines in grassland are formed in glacial till developed from gneiss and schist with some probable addition of loess. Soils are Typic Cryoborolls, and Argic Cryoborolls. They are moderately coarse to medium textured, deep, and moderately fertile. The dominant potential natural vegetation is Idaho fescue and bluebunch wheatgrass. Rock outcrop makes up 5 percent of the unit. This component represents 15 percent of this unit.

Lateral moraines are formed in glacial till developed from gneiss and schist material. Slope gradients range from 50 to 80 percent. Soils on these landforms are shallow to deep, moderately developed, medium and moderately fine textured. These soils are classified as Typic Cryoborolls, Typic Cryochrepts, and Typic Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This component represents 15 percent of this unit.

Compiled by: John R. Lane, Custer National Forest and Henry Shovic, Gallatin National Forest

LTA60-M332D

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This LTA is located in the Big Belt and Elkhorn Mountains and the Nevada-Alice Range within the Missouri River Basin.

Acreage by Section

60-M332D	310,782

LTA Settings and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain ridges, mountain slopes, structural benches and rolling uplands. Parent materials are residuum and colluvium underlain by argillite, siltite and quartzite with sandstone, shale and andesitic dikes and sills in places. Belt rocks within this section tend to be weakly metamorphosed and relatively thin bedded. They are often shale-like in appearance.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep and are medium textured. The vegetation is a mosaic of coniferous forest, shrublands and mountain grasslands. Mean annual precipitation ranges from 25 to 75 centimeters (10 to 30 inches). The elevation range of this LTA is 1068 to 2288 meters (3500 to 7500 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is highly to slightly dissected (widely to closely spaced drainages) by streams within the rolling upland, structural bench and mountain slope components of this LTA. The rolling uplands and structural benches tend to be moderately incised whereas the mountain slopes are deeply incised by streams. The dominant stream pattern is dendritic. The mountain ridge component of this LTA is undissected.

LTA Components: This landtype association consists of mountain slopes, mountain ridges, structural benches, and rolling uplands.

Mountain slopes are formed in colluvium and residuum mostly derived from argillite and siltite with sandstones, shales, and andesitic dikes and sills in places. Slope gradients range from 25 to 60 percent. Soils on these landforms are mostly deep and very deep. They tend to have moderate subsoil clay accumulation, particularly on the moderate slopes. The weakly metamorphosed zone within this section tends to have soils dominated by gravelly and channery rock fragments. They typically have gravelly, very gravelly, extremely gravelly, channery, very channery or extremely channery silt loam, loam or sandy loam surface textures in forested areas. Cobbles or flaggy material sometimes dominate in the more metamorphosed and thickly bedded Belts in parts of subsection M332Di. They are shallow and moderately deep, have modest development (dark surface layers and moderate clay subsoil accumulation where the soils are deeper), and have loam surfaces on grassland and shrubland potential sites. Subsurface textures (in both forested and non-forested settings) include mostly very to extremely gravelly and channery loams, clay loams and sandy loams. Some cobbly or flaggy material is associated with the more thickly bedded Belt rocks near the Continental Divide in subsection M332Di. Forested soils on moderate slopes are typically classified as Typic and Mollic Cryoboralfs. The steeper slopes are often more weakly developed Typic and Lithic Ustochrepts and Typic Cryochrepts. Lithic and Argic Cryoborolls and Typic Haploborolls are associated with grassland/shrubland potential sites. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is

subalpine fir and Douglas-fir series. Grassland/shrubland series include Idaho fescue, big sagebrush, and rough fescue. This component represents 60 percent of this LTA.

Mountain ridges are formed in residuum mostly derived from argillite and siltite with sandstone and shales in places. Thin volcanic ash influenced loess deposits affect the surface soils at higher elevations. Slope gradients range from 10 to 40 percent. Grassland or shrubland soils on these landforms are shallow and moderately deep, are moderately developed (thick dark surface layers and subsoil clay accumulation where soils are deeper), and have loam or channery loam surface textures. Forested soils are moderately deep and deep, are weakly or moderately developed and have loam, channery loam, channery silt loam. Subsurface textures for both forested and non-forested potential sites include very channery and extremely channery loams. Very cobbly and extremely cobbly loams and (in association with quartzite bedrock) extremely cobbly sandy loam can occur in some areas within the more metamorphosed Belts in subsection M332Di. These soils are classified as Lithic and Argic Cryoborolls, Mollic Cryoborolls and Typic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is rough fescue, Idaho fescue, big sagebrush, limber pine, Douglas-fir and subalpine fir series. This component represents 30 percent of this LTA.

Structural benches are formed in colluvium and residuum derived from argillite and siltite with sandstone and shale in places. Slope gradients range from 10 to 30 percent with inclusions of short 40 to 60 percent slopes near some drainages. Soils on these landforms are shallow and moderately deep and weakly developed at lower elevations. They are deep or very deep and better developed at higher elevations. Surface textures are mostly very gravelly or channery loam or extremely gravelly loam. Subsurface layers can have very to extremely gravelly or channery loam textures. Some very or extremely cobbly loams or clay loams can occur, particularly in the more metamorphosed zones in subsection M332Di. These soils are classified as Lithic and Typic Ustochrepts at lower elevations and Typic Cryoborolls and Typic Cryochrepts at higher elevations. Rock outcrop occurs on about 5 percent of this landform. The dominant potential natural vegetation includes Idaho fescue and bluebunch wheatgrass series. Forested habitat types at low elevations include Douglas-fir and ponderosa pine in some drainages and on some north aspects. Subalpine fir and Douglas-fir series dominate at higher elevations. Tufted hairgrass series occurs in depressions at higher elevations. This component represents 8 percent of this LTA.

Rolling uplands are formed in residuum and colluvium derived from argillite and siltite with sandstone, shale and basalt in places. Slope gradients range from 10 to 25 percent. Soils on these landforms are shallow and moderately developed (dark surface layers). They have silt loam and sandy clay loam surface textures. Subsurface layers tend to be very stony sandy clay loam. These soils are classified as Lithic Argiborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue and bluebunch wheatgrass series. This inclusion represents 2 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA61-M332D
LTA61-M332E

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: This LTA is located in the Boulder, Elkhorn and Highland Mountains on the Beaverhead-Deerlodge National Forest and the Helena National Forest in southwest Montana. It occurs in the upper Jefferson River, Prickly Pear Creek, 10 Mile Creek and Clark Fork River Basins.

Acreage by Subsection

61-M332D	251,536
61-M332E	308,903

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes, rolling uplands and alluvial flats. Parent materials are residuum underlain by weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with gravelly sandy and loamy textures. The vegetation is a mosaic of shrublands and grasslands and coniferous forest. Small areas of aspen are common. Mean annual precipitation ranges from 30 to 76 centimeters (12 to 30 inches). The elevation range of this LTA is 1373 to 2591 meters (4500 to 8500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately or highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component in this LTA on the Deerlodge National Forest.

LTA Components: This landtype association consists of stream dissected mountain slopes, rolling uplands, and alluvial flats.

Stream dissected mountain slopes are formed in weathered granitic bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, weakly and moderately developed, with gravelly sandy and loamy textures. These soils are classified as Typic and Lithic Cryoborolls, Cryochrepts, Cryoboralfs, and Cryorthents. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is sagebrush, Idaho fescue, Douglas-fir and subalpine fir series. This component represents 55 percent of this LTA.

Rolling uplands are formed in moderately and weakly weathered granitics granite-diorites and diorites. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep and deep, are weakly and moderately developed, and have sandy loam, gravelly sandy loam and loamy sand surface soils. The subsurface layers are gravelly sandy loams, gravelly loamy sands and loamy sands in the less developed soils and gravelly sandy clay loams and sandy clay loams where subsoil clay accumulation occurs. Ustochrepts, Eutroboralfs and Haploborolls prevail at the lower elevations. Typic and Lithic Cryoboralfs and Cryoborolls dominate at the mid to high elevations. Rock outcrop occurs on about 5 percent of this landscape component. Boulders are scattered on the surface on parts of the unit. The dominant potential natural vegetation is Douglas-fir series. The grassland/shrublands are dominated by mountain big sagebrush and roughfescue series. Spruce dominates the wet forest inclusions. This component represents 35 percent of this LTA.

Alluvial flats are formed in weathered granitic bedrock. Slope gradients range from 0 to 15 percent. Soils on these landforms are deep, weakly developed, with gravelly loamy textures. These soils are classified as Oxyaquic and Typic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 10 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA62-M332D
LTA62-M332E

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This LTA is located in the Ten Mile Creek basin, the Elkhorn Mountains, the Big Belt Mountains, and the Continental Divide Uplands.

Acreage by Section

62-M332D	88,948
62-M332E	949

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are residuum and colluvium underlain by granite, granitic diorite and diorite.

Accessory Characteristics: The primary soils have medium or moderately coarse textured surfaces and moderately coarse and coarse textured subsurface layers. The vegetation is a mosaic of coniferous forest and forested scree. Mean annual precipitation ranges from 50 to 75 centimeters (20 to 30 inches). The elevation range of this LTA is 1554 to 2438 meters (5100 to 8000 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is primarily undissected.

LTA Components: This landtype association consists of mountain slopes and ridges.

Mountain slopes and ridges are formed in weakly weathered granites, granite-diorites, and diorites. Higher elevations can have volcanic ash influenced surface soil. Slope gradients range from 10 to 60 percent. Soils on these landforms are extremely variable in terms of depth to bedrock, display little to no soil development and have cobbly loam, extremely cobbly sandy loam and extremely bouldery sand surface soils. Subsurface soils vary also and include extremely cobbly sandy loam, very cobbly sandy loam and extremely bouldery sand textures. These soils are mostly classified as Typic Cryochrepts and Typic Cryorthents. Boulders are scattered about the surface in portions of the unit. Rock outcrop and scree occurs on about 45 percent of this landscape component. The dominant potential natural vegetation is subalpine fir-whitebark pine series at the higher elevations with subalpine fir and Douglas-fir series on the lower slopes. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA63-M332D

MOUNTAIN SLOPES AND RIDGES: SCHISTS, GNEISSES AND ASSOCIATED METAMORPHICS

Location: This LTA occurs mainly in the Little Belt, Crazy and Castle mountains. This unit includes high elevation ridges within the Big Belts Mountains.

Acreage by Section

63-M332D	149,345

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs on ridges and steep valley sideslopes. Parent materials are gneiss, sandstone, shale and granite.

Accessory Characteristics: The primary soils are moderately deep skeletal loams and sandy loams. The vegetation is mostly grassland with some forested areas. Mountain ridgetop alpine meadows dominate in the Big Belt Mountains. Mean annual precipitation ranges from 50 to 100 centimeters (20 to 40 inches). The elevation range of this LTA is 1524 to 2134 meters (5000 to 7000 feet) on the Lewis and Clark National Forest and 2440 to 2898 meters (8000 to 9500 feet) on the Helena National Forest. The dominant slopes have gradients of 25 to 60 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being dendritic. Mountain ridges are often undissected.

LTA Components: This landtype association consists of steep valley sideslopes, and ridges and lower valley slopes.

The steep valley sideslopes are formed in sandstone, basalt, and gneiss. Slope gradients range from 25 to 60 percent. Soils on these landforms are moderately deep, weakly developed, extremely cobbly sandy-loams. These soils are classified as Typic Cryoboralfs and Typic Cryochrepts. Mollisolls are scattered throughout the Little Belts and Highwood Mountains. The dominant potential natural vegetation is a mosaic of subalpine fir and rough fescue. This component represents 35 percent of this LTA.

The ridges and lower valley slopes are formed in sandstone and shale. Slope gradients are 10 to 40 percent. Soils on these landforms are deep to moderately deep and moderately well developed. They have loam surfaces and clay loam or clay subsoils. These soils are classified as Boralfic Cryoborolls and Aquic Cryoboralfs. Typic Cryumbrepts dominate in the Big Belts Mountains.

They are mostly moderately deep with sandy loam surfaces and very gravelly sandy loam subsurface layers. The dominant potential natural vegetation is rough fescue and subalpine fir series on the Lewis and Clark National Forest and Idaho fescue series in the Big Belt Mountains. This component represents 50 percent of this LTA. Small wetlands occur within this unit.

Compiled by: Richard Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena/Lewis and Clark National Forests.

LTA64-M332Db
LTA64-331D

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located mostly in the Highwood and Castle mountain ranges in central Montana in the Missouri River Basin. Smaller amounts occur in the Little Belt, Snowy and Judith Mountains subsection.

Acreage by Subsection

64-M332Db	3,240
64-331D	26,813

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain slope landscape setting, which is typically composed of moderately steep to steep mountain slopes and valley sideslopes. Parent materials are latite, rhyolites, and shonkinites.

Accessory Characteristics: The primary soils are well drained, 20 to 60 inches in depth, slightly acidic to neutral and loamy skeletal. Vegetation is a complex of grassland and lodgepole pine forest. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1371 to 1982 meters (4500 to 6500 feet). The dominant slopes have gradients of 25 to 60 percent. This LTA is well dissected by streams, with the dominant stream pattern being subparallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in colluvium derived from rhyolite, latite, and shonkinite parent materials. Slope gradients range from 25 to 60 percent. Soils on these landforms are weakly developed, 20 to 60 inches in depth; loam topsoils are 4 to 10 inches thick, subsoils are brown loam with 10 to 75 percent cobble. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir at lower elevations, and subalpine fir at higher elevations.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA64-M332De
LTA64-M332Be
LTA64-M332Bk

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located in the Sapphire and Boulder Mountains on the Beaverhead-Deerlodge and Helena National Forests in the upper Clark Fork River Basin in southwest Montana. It also occurs along the Continental Divide in the Alice-Nevada Mountains.

Acreage by Subsection

64-M332De	6,116
64-M332Be	12,963
64-M332Bk	7,098

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are residuum and colluvium underlain by rhyolite and tuff. Ridges often have ash influenced soil surfaces.

Accessory Characteristics: The primary soils have medium textured to moderately coarse textured surfaces and moderately coarse to coarse textured subsurface layers. The vegetation is coniferous forest. Mean annual precipitation ranges from 50 to 75 centimeters (20 to 30 inches). The elevation range of this LTA is 1676 to 2195 centimeters (5500 to 7200 feet). The dominant slopes have gradients of 10 to 60 percent. The mountain slopes within this LTA are poorly dissected by weakly incised streams. Ridges are mostly undissected.

LTA Components: This landtype association consists of mountain slopes and ridges.

Mountain slopes and ridges are formed in rhyolites and tuffs. Slope gradients range from 10 to 60 percent. Soils on these landforms are moderately deep and weakly developed. Surface textures range from very gravelly sandy loam on steeper slopes to loams on volcanic ash influenced ridges. Subsurface textures are often very cobbly coarse sandy loam or extremely cobbly loamy sand. These soils are classified as Dystric Cryochrepts and Andic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. Small areas of subalpine fir-whitebark pine series occur at high elevations. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA64-M332D
LTA64-M332E
LTA64-M331A

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located in the Boulder, Elkhorn, Fleecer, Anaconda, Pintlar, Beaverhead, Madison, Pioneer, Lima Peaks, Gravelly, Tendoy, and Gallatin Mountains on the Beaverhead-Deerlodge, Helena, and Gallatin National Forests. It occurs in the upper Missouri River Basin and the upper Little Blackfoot drainage in southwest Montana.

Acreage by Section

M332D	190,576 (Section except for M332Db and M332De)
M332E	216,157
M331A	21,407

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes and mountain ridges. Parent materials are residuum underlain by Tertiary and Cretaceous volcanic bedrock, including andesite, dacite, rhyolite, welded and non-welded rhyolite and felsic tuffs, and locally basalt and minor metagabbro dikes.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep loamy soils often with high cobble contents. The vegetation is a mosaic of coniferous forest and shrubland/grassland, coniferous forest or shrubland /grassland. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1525 to 2378 meters (5000 to 7800 feet). The dominant slopes have gradients of 5 to 60 percent. The mountain slopes component of this LTA are moderately dissected by streams with the dominant stream patterns being parallel or dendritic. The mountain ridges are generally undissected. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes, and mountain ridges.

Stream dissected mountain slopes are formed in colluvium and residuum over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Slope gradients range from 25 to 60 percent. Soils on these landforms are shallow, moderately deep and deep to bedrock. They are moderately and weakly developed with cobbly and very cobbly loam surface textures. The subsurface layers are very cobbly and extremely cobbly loams. These soils are classified as Typic and Lithic Cryochrepts and Cryoborolls, and Typic and Mollic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 50 percent of this LTA.

Mountain ridges are formed in residuum and colluvium over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Included in this component is rolling uplands found in the eastern portion of the Elkhorns. Slope gradients range from 10 to 40 percent. Soils on these landforms are mostly moderately deep and shallow to bedrock. They are moderately and weakly developed with cobbly, stony and very cobbly loam or loam surface textures. The subsurface layers are very cobbly, very stony, extremely cobbly and extremely stony loams and clay loams. These soils

are mostly classified as Typic and Lithic Cryochrepts on forested sites and Argic and Lithic Cryoborolls on grassland/shrublands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is rough fescue, big sagebrush, Douglas-fir, and subalpine fir series. This component represents 50 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA65-M332D
LTA65-M332E

MOUNTAIN SLOPES AND RIDGES: SOFT SEDIMENTARY ROCKS

Location: This LTA is located in nearly all the mountain ranges on the Lewis and Clark (Rocky Mountain Front, Big & Little Snowies, Crazies, Castles, and Little Belt mountains). It also occurs in the Fleecer and Bull Mountains in southwest Montana on the Beaverhead-Deerlodge Forest.

Acreage by Section

65-M332D	42,266
65-M332E	17,413

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on benches, basins, ridges, and valley sideslopes. Parent materials are soft sandstones and shales.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep, skeletal, loams and sandy loams. The vegetation is coniferous forest and fescue grassland. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1500 to 2439 meters (5000 to 8000 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is moderately dissected with the dominant stream pattern being dendritic. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of benches and lower valley slopes, steep valley sideslopes, and ridges and upland flats and basins.

Benches and lower valley slopes are formed in shale, sandstone, and alluvium. These landforms have slope gradients that range from 0 to 25 percent. Soils on these landforms are moderately deep and deep, well developed, and consist mainly of clay loam and clay. The major soils are classified as Typic and Vertic Cryoborolls. Rock outcrop occurs on 5 percent of this landscape component. The dominant potential natural vegetation is rough fescue and Douglas-fir. This component represents 30 percent of this LTA.

Steep valley sideslopes are formed in shale and sandstone. These landforms have slope gradients that range from 25 to 60 percent. Soils on these landforms are moderately deep, weakly developed, and consist mainly of very gravelly and cobbly loams and sandy loams. The major soils are classified as Typic Cryoborolls and Cryoboralfs. Rock outcrop makes up less than 15 percent of this component. The dominant potential natural vegetation is rough fescue subalpine fir, Douglas-fir, and limber pine. This component represents 35 percent of this LTA.

Ridges and upper slopes and basins are formed in sandstone and shale. These landforms have slope gradients that range from 10 to 40 percent. Soils on these landforms are extremely cobbly loams and sandy loams. The major soils are classified as Typic and Andic Cryoborolls and Cryochrepts. Rock outcrop makes up less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir and rough fescue. This component represents 20 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA66-M332Dm
LTA66-M332Ea

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located in the Elkhorn and Highland Mountains on the Beaverhead-Deerlodge National Forest in southwest Montana in the Jefferson River Basin.

Acreage by Subsection

66-M332Dm	19,493
66-M332Ea	4,501

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and shrublands and grasslands. Mean annual precipitation ranges from 36 to 51 centimeters (14 to 20 inches). The elevation range of this LTA is 1677 to 2287 meters (5500 to 7500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in limestone bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, and have cobbly loamy textures. These soils are classified as Typic and Lithic Cryochrepts and Cryoboralfs; and Argic and Lithic Cryoborolls. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA66-M332D

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located primarily in the Little Belt, Big Belt and Elkhorn Mountain Ranges.

Acreage by Section

66-M332D 360,264 (Section except M332Dm)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs on ridgetops, plateaus or dip slopes, steep valley slopes, and benchy lower valley slopes. Parent materials are Paleozoic limestones.

Accessory Characteristics: The primary soils are moderately deep, loamy-skeletal soils with loamy textures. The local vegetation can be dominantly forest, a mosaic of grassland/shrubland and forest, or grassland/shrubland. Mean annual precipitation ranges from 50 to 127 centimeters (15 to 50 inches). The elevation range of this LTA ranges from 1068 to 2878 meters (3500 to 9500 feet). The dominant slopes have gradients of 10 to greater than 60 percent.

LTA Components: This landtype association consists of ridge tops, plateaus and dip slopes, steep valley sideslopes, and benchy lower sideslopes. All of these are typically formed in limestone.

Ridgetops typically have slopes of 10 to 25 percent. Soils on these landforms are moderately deep and weakly to moderately developed. Surface textures are silt loams or gravelly to very gravelly silt loams or silty clay loams. Subsurface textures are generally very or extremely gravelly silt loams, clay loams or silty clay loams. The major soils are classified as Typic Cryochrepts in the Little Belt Mountains. Calcic Cryoborolls, Mollic Cryoboralfs and Lithic Cryochrepts dominate in the other subsections. The major potential natural vegetation is rough fescue, big sagebrush, Douglas-fir, whitebark pine-subalpine fir and spruce series. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 30 percent of this LTA. Plateaus or dip slopes are typically on slopes of 10 to 25 percent. Soils on these landforms are mostly moderately deep or shallow and weakly to moderately developed. Surface textures are gravelly or very gravelly loams, silty clay loams or silt loams. The subsurface layers are very or extremely gravelly loams and silt loams. The major soils are classified as Typic Ustochrepts in the Little Belts. Lithic Ustochrepts, Calcic Cryoborolls and Mollic Cryoboralfs dominate in the other subsections. The major potential natural vegetation is Douglas-fir, ponderosa pine, rough fescue, and big sagebrush series. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 20 percent of this LTA.

Steep valley sideslopes are on slopes of 25 to 60 percent. Soils on these landforms are moderately deep, moderately well developed, Typic Cryochrepts. The major potential natural vegetation is Douglas-fir and subalpine fir. Rock-outcrop occurs on less than 15 percent of this LTA. This component represents 40 percent of this LTA.

Benchy lower sideslopes are on slopes of 10 to 25 percent. Soils on these landforms are moderately deep and deep, weakly and moderately well developed. They are mainly Typic Cryoboralfs and Cryoborolls, with considerable acreage of Vertic Cryoborolls. The major potential natural vegetation is Douglas-fir. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 10 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest, and Larry Laing Helena and Lewis and Clark National Forests.

LTA67-M332D

MOUNTAIN SLOPES AND RIDGES: QUARTZITES

Location: This LTA is located primarily in the Little Belt Mountain Range.

Acreage by Section

67-M332D	41,037

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on ridgetops and hilly valley floors. Parent material is dominantly quartzite from Cambrian and Precambrian formations.

Accessory Characteristics: The primary soils are deep, loamy-skeletal, stony sandy-loams. The vegetation is coniferous forest. Mean annual precipitation is 64 to 76 centimeters (25 to 30 inches). The elevation range is 1981 to 2286 meters (6500 to 7500 feet). The dominant slopes have gradients of 0 to 10 percent.

LTA Components: This landtype association consists of ridge tops and hilly valley floors.

These ridge tops and hilly valley floors have slopes of 0 to 10 percent. Soils on these landforms are deep, weakly developed, Typic Cryochrepts. The major potential natural vegetation series is Douglas-fir. Rock outcrop occurs on less than 15 percent of this LTA. This component represents the entirety of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA68-M332Dm

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Elkhorn Mountains, Beaverhead-Deerlodge and Helena National Forests in the Jefferson River Basin in southwest Montana.

Acreage by Subsection

68-M332Dm	14,194

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum and colluvium underlain by sandstone and shale bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with gravelly, channery and cobbly loamy textures. The vegetation is a mosaic of coniferous forest, shrublands, and grasslands. Mean annual precipitation ranges from 25 to 76 centimeters (10 to 30 inches). The elevation range of this LTA is 1464 to 2439 meters (4800 to 8000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams with the dominant stream patterns being parallel and dendritic. Mountain ridges tend to be undissected. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in sandstone and shale bedrock. Some areas of mountain ridges and structural benches are included in this component. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, with gravelly, channery and cobbly loamy textures. These soils are classified as Typic and Lithic Cryochrepts, Mollic and Typic Cryoboralfs, Typic Eutroboralfs, Lithic and Typic Ustochrepts, and Lithic and Argic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. Grassland/shrubland series include Idaho fescue, rough fescue, and big sagebrush. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Deerlodge National Forest; Larry Laing, Helena National Forest

LTA68-M332Dp
LTA68-M331Aa
LTA68-M331Ap

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This unit is located in the Bridger, Gallatin, and Madison Mountain Ranges in southwestern Montana.

Acreage by Section:

68-M332Dp	81,951
68-M331Aa	20,334
68-M331Ap	79,259

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of a complex of mountain slopes and ridges, with overall shapes controlled by underlying bedrock structure. Soil parent material is colluvium and residuum derived from thinly to thickly interbedded sandstone and shale with some limestone.

Accessory Characteristics: Vegetation is dense lower subalpine forest or mountain grassland. Elevation ranges from 1981 to 2377 meters (6500 to 7800 feet). Mean annual precipitation is 75 to 100 centimeters (30 to 40 inches). Slope ranges from 0 to 40 percent.

LTA Components: This landtype association has four components:

Soils in mountain grasslands are Typic Cryoborolls and Argic Cryoborolls. They are deep, medium to moderately fine textured, rocky in some areas, and have moderate to high fertility and water holding capacity. Rock outcrop makes up 5 percent of this component. Common potential vegetation includes Idaho fescue and big sagebrush series. This component makes up 20 percent of this LTA.

Where rock types are thinly inter-bedded sandstone and shale and vegetation is densely or sparsely forested, soils are Typic and Mollic Cryoboralfs and Argic Cryoborolls. They are deep, medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up 5 to 20 percent of this component. Common potential vegetation includes Douglas-fir, subalpine fir, Idaho fescue and big sagebrush series. This component makes up 40 percent of this LTA.

Where rock types are thickly inter-bedded sandstone and shale, and vegetation is densely or sparsely forested, soils are Typic and Mollic Cryoboralfs, Argic Cryoborolls, and Typic Argiborolls. They are deep, medium to moderately fine textured, non-rocky, and have high fertility and water holding capacity. Rock outcrop makes up 5 to 20 percent of this component. Common potential vegetation includes subalpine fir, subalpine fir-whitebark pine, Douglas-fir, Idaho fescue and big sagebrush series. This component makes up 20 percent of this LTA.

Where rock types are limestone, sandstone, and shale, soils are Typic Ustochrepts, Typic Calciborolls, Cryoboralfs and Cryochrepts. These soils are deep to moderately shallow, moderately coarse to moderately fine textured, rocky, and have low to moderate fertility and water holding capacity. Rock outcrop makes up 15 to 25 percent of this component. Common potential vegetation includes subalpine fir and Douglas-fir series. This component makes up 20 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA68-M332D
LTA68-M332C
LTA68-331D

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Little Belt Mountains and along the Rocky Mountain Front on the Lewis and Clark National Forest, and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

68-M332D	240,099	(Section except for M332Dm and M332Dp)
68-M332C	80,557	
68-331D	8,549	

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain slope or ridge setting which is typically composed of stream-dissected mountain slopes and ridges. Parent materials are sandstone and shale.

Accessory Characteristics: The primary soils are moderately deep, loamy-skeletal loamy-sands and loams. The vegetation is a mosaic of subalpine fir and rough fescue series. Mean annual precipitation ranges from 36 to 89 centimeters (14 to 35 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). This LTA is moderately dissected by streams with the dominant pattern being parallel. Wetlands are a minor component.

LTA Components: This landtype association consists of low relief ridges and slopes, and steep valley sideslopes.

The low relief ridges and slopes are formed in sandstone and shale. Slope gradients are from 10 to 40 percent. Soils on these landforms are moderately deep to deep, moderately well developed, extremely gravelly loams. These soils are classified as Typic and Argic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is rough fescue and subalpine fir. This component represents 55 percent of this LTA.

The steep valley sideslopes are formed in sandstone and shale. Slope gradients are from 40 to 60 percent. The soils are classified as Typic and Andic Cryochrepts in Subsections M332Cb, M332Cd, M332Dc, and M332Dd; soils in subsection M332Dm are Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. This component represents 30 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA69-M332D

PEDIMENTS: GRAVEL MANTLED VOLCANICS AND TERTIARY SEDIMENTS

Location: This LTA is located in the foothills near the Bull Mountains and Elkhorn Mountains in the vicinity of the Beaverhead-Deerlodge National Forest in southwest Montana. It also occurs in the Boulder River basin in Subsection M332Dk.

Acreage by Section

69-M332D 27,695

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in a valley landscape setting which is typically composed of pediments and alluvial fans. Parent materials are coarse mantle deposits from a variety of sources, deposited over volcanic and Tertiary sedimentary bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep, cobbly and gravelly sandy loams and loams. The vegetation is a mosaic of grassland and shrubland. Mean annual precipitation ranges from 25 to 36 centimeters (10 to 14 inches). The elevation range of this LTA is from 1372 to 1524 meters (4500 to 5000 feet). The dominant slopes have gradients of 5 to 10 percent. This LTA is moderately dissected by intermittent streams with the dominant stream patterns being parallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of two landform components: pediments and alluvial fans.

Pediments are formed on volcanic and Tertiary sedimentary rocks with a mantle of coarse debris from the adjoining uplands on the surface. Slope gradients range from 5 to 10 percent. Soils on these landforms are moderately deep to deep. They are moderately to weakly developed with cobbly and very cobbly sandy and loamy surface textures. The subsurface layers are cobbly and very cobbly loams and clay loams. These soils are classified as Ustochrepts, Argiborolls and Haploborolls. Rock outcrop occurs on about ten percent of this landscape component. The dominant potential natural vegetation is needle-and-thread grass/blue grama; bluebunch wheatgrass/blue grama, and sagebrush /bluebunch wheatgrass habitat types. This component represents 60 percent of this LTA.

Alluvial fans are formed in coarse alluvial and glaciofluvial deposits originating from a variety of bedrock types. Slope gradients range from 5 to 15 percent. Soils on these landforms are moderately deep to deep; are weakly to moderately developed, and have cobbly and gravelly sandy loam and loam surface soils. The subsurface layers are cobbly sandy loams and loams in the less developed soils and cobbly sandy clay loams and clay loams where subsoil clay accumulation occurs. These soils are classified as Ustochrepts, Argiborolls and Haploborolls. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is needle-and-thread/blue grama, bluebunch wheatgrass/blue grama, and sagebrush /bluebunch wheatgrass. This component represents 40 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest.

LTA70-M332D
LTA70-M332E

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This LTA is located in the Fleecer, Highlands, Anaconda-Pintlar, Pioneer, Beaverhead, Tendoy, and Lima Peaks (Beaverhead Mountains) ranges of the Beaverhead/Deerlodge National Forest. It occurs in the Jefferson and Madison River Basins in southwest Montana.

Acreage by Section

70-M332D	419
70-M332E	132,440

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping, mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from metamorphosed sediments of the Precambrian Belt Supergroup, undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are very shallow to moderately deep, channery and flaggy sandy loams and loams. The vegetation is a mosaic of alpine turf, subalpine grasslands, subalpine forest, montane coniferous forest and mountain grassland. Mean annual precipitation ranges from 36 to 127 centimeters (14 to 50 inches). The elevation range of this LTA is 2134 to 3353 meters (7000 to 11000 feet). The dominant slopes have gradients of 25 to 50 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes and ponds are a minor component of this unit. Some glaciated areas are included in this unit, but frost shattering has become a dominant landform process since glaciation.

LTA Components: This landtype association consists of frost shattered slopes and ridges.

Frost shattered slopes and ridges are formed in colluvium and residuum derived from metasediment rocks comprised mostly of quartzite, siltite, and argillite. Slope gradients range from 5 to 70 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately developed, stony loamy sands, sandy loams, and loams. These soils are classified as Typic and Alfic Cryorthents, and Alfic, Dystric, and Typic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. In the Highland Mountains, up to 50 percent of the unit is scree. The dominant potential natural vegetation is sedge, Idaho fescue, subalpine fir, whitebark pine-subalpine fir, and big sagebrush series. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA72-M332Db

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Little Belt Mountains of west-central Montana.

Acreage by Section

72-M332Db	1,687

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridges and upper valley sideslopes. Parent materials are colluvium and residuum underlain by weakly weathered granitic rocks.

Accessory Characteristics: The primary subsoils are deep with clay loam textures and contain 35 to 50 percent rock fragments. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 89 centimeters (30 to 35 inches). The elevation range is 2286 to 2590 meters (7500 to 8500 feet). The dominant slopes have gradients of 0 to 40 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included in this map unit.

LTA Components: This landtype association consists of ridge tops and upper valley sideslopes.

Upper valley sideslopes are formed in a thin layer of wind-deposited silt that underlain by weakly weathered granitic rocks. Slope gradients range from 20 to 40 percent. Soils on this landform are deep and well drained. These soils are weakly developed and consist of silt loam surface layers and clay loam substrata. The dominant soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 70 percent of this unit.

Frost shattered ridge tops are formed in residuum and colluvium derived from weakly weathered granitic rocks. Slope gradients range from 0 to 20 percent. Soils on this landform are deep and well drained, and are similar to those described above. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir plant associations. This component represents 30 percent of this unit.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA72-M332Dc
LTA72-M332Dp
LTA72-M332E
LTA72-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Gallatin, Madison, Absaroka-Beartooth Mountain Ranges in southwestern Montana. Included are the Crazy Mountains, Bridger Mountains, Anaconda Mountains and Continental Divide Uplands.

Acreage by Section:

72-M332Dc	1,571
72-M332Dp	106
72-M332E	838
72-M331A	25,079

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of rounded ridgetops with weak stream dissection. Soil parent material is frost shattered glacial till and colluvium derived from hard crystalline rocks such as granite.

Accessory Characteristics: Vegetation is alpine turf or sparse to dense upper subalpine and lower subalpine forest. Elevation ranges from 1981 to 2987 meters (6500 to 9800 feet). Mean annual precipitation is greater than 125 centimeters (50 inches). Slopes ranges from 0 to 20 percent.

LTA Components: This landtype association has two components:

Soils on rounded ridgetops in forest are Typic and Dystric Cryochrepts. They are deep, moderately coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up five percent of this component. The dominant potential natural vegetation is the subalpine fir, and subalpine fir-whitebark pine series. This component makes up 70 percent of this LTA.

Soils on rounded ridgetops with alpine turf are Dystric Cryochrepts. They are moderately deep, coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 percent of this component. A common potential natural vegetation series is Idaho fescue. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA73-M332D
LTA73-M332E

FROST SHATTERED MOUNTAIN RIDGE TOPS, VOLCANICS

Location: This LTA is located in the Gravelly, Fleecer, Boulder, Elkhorn, and Anaconda-Pintlar (Beaverhead Mountains) Ranges of southwest Montana, in the Jefferson and Madison River basins on the Beaverhead-Deerlodge National Forest.

Acreage by Section

73-M332D	23,449
73-M332E	14,106

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting at or above the zone of moderate and strong frost churning. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from mostly Tertiary volcanic rocks and volcaniclastic rocks, including andesite, dacite, and rhyolite, welded and non-welded tuffs, and locally minor metagabbro dikes.

Accessory Characteristics: The primary soils are shallow to moderately deep, channery loams and sandy loams. The vegetation is mostly subalpine coniferous forest. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 2134 to 2896 meters (7000 to 9500 feet). The dominant slopes have gradients of 5 to 20 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being dendritic, or is undissected. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered slopes and ridges.

Frost shattered slopes and ridges are formed in colluvium and residuum derived from volcanic rocks comprised mostly of rhyolite, welded tuffs, and andesite. Slope gradients range from 5 to 50 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, well drained channery loams and sandy loams and extremely cobbly loams. These soils are classified as Lithic and Typic Cryoboralfs, Lithic and Typic Cryochrepts, and Typic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. On the Helena NF, up to 25 percent of the unit is scree. The dominant potential natural vegetation is whitebark pine-subalpine fir, rough fescue, and Idaho fescue series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA74-M332D
LTA74-M332E
LTA74-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES AND SHALES

Location: This LTA is located in the Pioneers, Fleecers, Beaverhead Mountains, (south), Tendoy, Tobacco Roots, Gravellys, and Madison Ranges in southwest Montana in the Jefferson and Madison River Basins.

Acreage by Section

74-M332D	859
74-M332E	70,884
74-M331A	9,208

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost churned ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from Tertiary sediments consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rocks occur.

Accessory Characteristics: The primary soils are very shallow to moderately deep silt loams, loams and clay loams. The vegetation is a mosaic of alpine turf, alpine and subalpine coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 41 to 127 centimeters (16 to 50 inches). The elevation range of this LTA is 2286 to 3048 (7500 to 10000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in colluvium and residuum derived from sandstones and shales. Slope gradients range from 10 to 50 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately well developed, silt loams, loams, and clay loams. The surface soils can be highly organic above 9000 feet (2743 meters). These soils are classified as Lithic Cryoborolls and Typic Cryoborolls, Typic Cryochrepts, and Mollic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sedge, whitebark pine-subalpine fir, and Douglas-fir series. This component represents 95 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA75-M332D

FROST SHATTERED MOUNTAIN RIDGE TOP: CALC-SILICATES AND QUARTZITES

Location: This LTA is located in the Little Belt Mountains on the Lewis and Clark Forest.

Acreage by Subsection

75-M332D	36,716

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on mountain ridge top flats and consists of very old, clayey alluvial or glacial deposits of unknown origin overlying sandstone or quartzite beds. Soils may be wet for extended periods of time and develop perched water tables.

Accessory Characteristics: Primary soils are very strongly developed topsoils 12 to 20 inches deep and contain 15 to 35 percent angular quartzite cobbles. Soils are underlain by confining quartzite bedrock at depths of 60 inches or greater. Subsoils are heavy clay and slowly permeable to water. Mean annual precipitation ranges from 64 to 76 centimeters (25 to 30 inches). The elevation range of this LTA is 1676 to 2286 meters (5500 to 7500 feet). The unit is only slightly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a major component of the unit.

LTA Components: This landtype association consists of mountain ridgetops.

Gently sloping mountain ridgetops parallel the dip of underlying sandstone or quartzite beds. Landforms have slope gradients that range from 0 to 25 percent. Soils on these landforms are strongly developed and consist of loam topsoils, 12 to 20 inches thick, with mottles of reddish-brown color. Subsoils are a dark brown clay. Soils are classified as Aquic Cryoboralfs. Rock outcrop occurs on 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and spruce series. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA81-M332D
LTA81-M332E

LOW RELIEF HILLS: WEATHERED GRANITICS

Location: This LTA is located in the Boulder and Highland Mountains on the Beaverhead-Deerlodge National Forest in southwest Montana. It occurs in the upper Jefferson River and Clark Fork River Basins.

Acreage by Section:

M332D	106,587
M332E	77,434

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of rolling uplands. Parent materials are residuum and colluvium underlain by weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with gravelly sandy and loamy textures. The vegetation is coniferous forest and a mosaic of shrublands and grasslands and coniferous forest. Small areas of aspen are common. Mean annual precipitation ranges from 30 to 76 cms. (12 to 30 inches). The elevation range of this LTA is 1373 to 2591 meters (4500 to 8500 feet). The dominant slopes have gradients of 5 to 30 percent. This LTA is moderately or highly dissected by streams, with the dominant stream pattern being parallel or dendritic. Wetlands are a major component in this LTA.

LTA Components: This landtype association consists of two landform components: rolling uplands and alluvial flats.

Rolling uplands are formed in weathered quartz monzonite and similar coarse-grained igneous rocks of the Boulder Batholith. Slope gradients range from 0 to 40 percent. Soils on these landforms are shallow, moderately deep, to deep; are weakly to moderately developed, and have sandy loam, gravelly sandy loam and loamy sand surface soils. The subsurface layers are gravelly sandy loams, gravelly loamy sands and loamy sands in the less developed soils; and gravelly sandy clay loams and sandy clay loams where subsoil clay accumulation occurs. Ustochrepts, Eutroboralfs and Haploborolls prevail at the lower elevations. Typic and Lithic Cryochrepts, Cryoboralfs and Cryoborolls dominate at the mid to high elevations. Rock outcrop occurs on 5 to 15 percent of this landscape component. Boulders are scattered on the surface on parts of the unit. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 80 percent of this LTA.

Alluvial flats are formed in granitic alluvium and weathered granitic bedrock. Slope gradients range from 0 to 15 percent. Soils on these landforms are deep, weakly developed, with gravelly loamy textures. These soils are classified as Oxyaquic and Typic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 20 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest.

LTA82-M332D
LTA82-M332E

LOW RELIEF HILLS: VOLCANICS

Location: This LTA is located in the Boulder Mountains on the Beaverhead-Deerlodge Forest in southwest Montana. It occurs in the upper Clark Fork River basin.

Acreage by Section

82-M332D	13,249
82-M332E	6,817

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of rolling hills. Parent materials are residuum underlain by Tertiary and Cretaceous volcanic bedrock, including andesite, rhyolite, and welded and non-welded rhyolite and felsic tuffs.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep loamy soils often with high cobble contents. The vegetation is coniferous forest and a mosaic of coniferous forest and shrubland/grassland. Mean annual precipitation ranges from 38 to 75 cms. 15 to 30). The elevation range of this LTA is 1525 to 2135 meters (5000 to 7000). The dominant slopes have gradients of 5 to 30 percent. This LTA is slightly to moderately dissected by streams with the dominant stream patterns being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of one landform component: rolling hills.

Rolling hills are formed in colluvium and residuum over a variety of volcanic bedrock. Slope gradients range from 5 to 30 percent. Soils on these landforms are shallow, moderately deep and deep to bedrock. They are moderately and weakly developed with cobbly and very cobbly loam surface textures. The subsurface layers are cobbly and very cobbly loams and clay loams. These soils are classified as Typic and Lithic Cryochrepts and Cryoborolls, and Typic and Mollic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest.

LTA83-M332D
LTA83-M332C

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This LTA is located on the Lewis and Clark National Forest. It occurs mostly in the Little Belt Mountains with minor amounts in the Rocky Mountain Front.

Acreage by Section

83-M332D	95,156
83-M332C	329

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a low relief hills setting, which is typically composed of old clayey deposits. Parent materials are residuum underlain by sedimentary rocks, usually sandstones and shales.

Accessory Characteristics: The primary soils are moderately deep with loamy and clayey textures. The vegetation is coniferous forest. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1676 to 2286 meters (5500 to 7500 feet). The dominant slopes have gradients of 0 to 25 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of old clayey alluvial deposits.

Old clayey alluvial deposits are formed in sandstone and shale sedimentary rocks. Slope gradients range from 0 to 25 percent. Soils on these landforms are moderately deep, strongly developed, with loamy and clayey textures. These soils are classified as Aquic Cryoboralfs. Rock outcrop generally is not found in this landscape component. The dominant potential natural vegetation is alpine fir habitat types. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA90-M332Dg
LTA90-M332Dh

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA in the Big Belt Mountains of the Missouri River basin.

Acreage by Subsection

90-M332Dg	2,678
90-M332Dh	6,222

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are old landslide deposits underlain by highly weathered volcanic, limestone and/or metasedimentary rock.

Accessory Characteristics: The primary soils are very deep and have clayey subsoils. The vegetation is coniferous forest and/or mountain grassland. Mean annual precipitation ranges from 50 to 63 centimeters (20 to 25 inches). The elevation range of this LTA is 1678 to 2012 meters (5500 to 6600 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being deranged. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of landslides.

Landslides are formed in landslide deposits associated with highly weathered volcanic, limestone and/or metasedimentary bedrock. Slope gradients range from 10 to 40 percent. Soils on these landforms are very deep and well developed. They have moderately fine textured surface layers and high subsoil clay accumulations. They typically have silty clay loam or silt loam surface textures. Subsoils are silty clay loam and silty clay with more than 35 percent rock (mostly gravel and cobble). These soils are classified as Mollic Cryoboralfs. Argic Cryoborolls are associated with mountain grasslands. Inclusions of Typic Cryaquolls are in bogs. The dominant potential natural vegetation is subalpine fir on northerly aspects. Douglas-fir and subalpine fir series are often on warmer aspects. The dominant potential natural vegetation in the grassland areas is rough fescue.

Compiled by: Larry Laing, Helena National Forest

LTA90-M332D
LTA90-331D
LTA90-M332C

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located primarily in the Little Belt and Big Snowy Mountain Ranges on the Lewis and Clark Forest.

Acreage by Section

90-M332D	64,947 (Section except for M332Dg and M332Dh)
90-331D	2,563
90-M332C	67,245

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of valley sideslopes and benchy lower valley slopes. The primary parent material is shale, but some undifferentiated material is also present.

Accessory Characteristics: The primary soils are deep, clayey and loamy-skeletal silt loams and silty clay loams. The vegetation is coniferous forest. Mean annual precipitation is 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1350 to 2100 meters (4500 to 7000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately dissected, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of rotational slumps and mud flows, benchy lower valley slopes, and upper valley sideslopes.

Rotational slumps and mud flows are formed in shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep, weakly developed, and consist of mainly of loam, silt loam, and cobble. The major soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is subalpine fir. This component represents 55 percent of this LTA.

Benchy lower valley slopes are formed in shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep and deep, weakly developed, and consist of loam, silt loam and gravel. The major soils are classified as Typic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir. This component represents 30 percent of this LTA.

Upper valley sideslopes are formed in shale. Slope gradients range from 10 to 25 percent. Soils on these landforms are shallow, moderately developed and consist mainly of loam and cobble. The major soils are classified as Mollic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir. This component represents 15 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA92-M332D
LTA92-M332B
LTA92-M332E

COLLUVIAL SLOPES: MIXED GEOLOGY

Location: This LTA is located throughout the Helena National Forest.

Acreage by Section

92-M332D	12,928
92-M332B	6,383
92-M332E	3,557

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are colluvial deposits, in basins and on toeslopes, typically influenced by metasedimentary and volcanic rocks.

Accessory Characteristics: The primary soils are very deep and have loamy or clayey subsoils. The vegetation is coniferous forest. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1464 to 2135 meters (4800 to 7000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is highly dissected but weakly incised by streams, with the dominant stream pattern being parallel or subparallel. Wetlands are a major inclusion in this LTA.

LTA Components: This landtype association consists of colluvial deposits.

Colluvial deposits are derived from metasedimentary and volcanic rock. Some areas are also influenced by limestone colluvium. Slope gradients range from 10 to 50 percent. Soils on these landforms are very deep and weakly to well developed. They have moderately fine textured surface layers and high subsoil clay accumulations. They typically have very cobbly loam or cobbly silt loam surface textures. Subsoils are very cobbly loam, clay loam or silty clay loam. These soils are classified as Typic Cryochrepts, Typic Cryoboralfs, and Argic Cryoborolls. Inclusions of Aquic Cryoborolls, Aquic Cryoboralfs and Typic Cryaquepts are associated with seeps and springs. The dominant potential natural vegetation is subalpine fir, spruce and Douglas-fir.

Compiled by: Larry Laing, Helena National Forest

CHAPTER 9

LTA Descriptions

Section M332E Beaverhead Mountains

This Section occurs in southwest Montana and east-central Idaho. It is part of the Southwest Montana Mountains and Valleys geomorphic area previously described. Forty seven LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. The map unit descriptions are preceded by the following illustrations:

Figure 35: Map showing location of M332E within the Northern Region

Figure 36: M332E landscape photograph, Tendoy Mountains
Beaverhead-Deerlodge National Forest

Figure 37: Map showing distribution of LTAs within M332E

Figure 38 Bar chart showing abundance of landform groups within M332E

Figure 39: Bar chart showing abundance of geologic material
groups within M332E

LTA10-M332En

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located throughout the Snowcrest, Greenhorn and Gravelly mountain ranges and basins in southwest Montana which are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

10-M332En 3,699

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in valley bottoms and alluvial basins. The coarse alluvium is derived gneiss, metasedimentary rocks, sandstones and related rock types.

Accessory Characteristics: Dominant soils are deep to very deep coarse loams. There are minor amounts of organic soils and soils with organic surfaces. The vegetation varies from sedges, willows and wetforb types to conifers with moist forb understories. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range is 2012 to 1622 meters (6600 to 8600 feet). The slope range is 0 to 20 percent, with dominant slopes 5 to 15 percent. This unit is slightly to moderately dissected by streams, with the stream pattern being dendritic.

LTA Components This landtype association consists of alluvial basins, and valley bottoms.

Alluvial basins are wide openings in a valley bottom drained by a meandering stream and underlain by sediments deposited by running water. Slopes range from 0 to 20 percent with dominant slopes, 2 to 15 percent. Dominant soils include Pachic Cryoborolls and Cryaquolls under mountain big sagebrush and Idaho fescue series. Under carex, willow and moist forb series the soils are Histic Cryaquolls or be Histisols. Under spruce and subalpine fir series, soils are Typic Cryochrepts. Soils are well to excessively drained. This component represents about 70 percent of the unit.

Valley bottoms are areas containing the present stream and built of sediment deposited during overflows during flood stages of past and present stream regimes. The slopes range 0 to 20 percent with dominant slopes, 2 to 15 percent. Soils are poorly developed and include Fluvents under carex and willow series. Typic Cryoborolls and Cryaquolls occur under mountain big sagebrush and Idaho fescue series. Under spruce and subalpine fir series, Typic Cryochrepts occur. Mottles can be present throughout the soil profile indicative of fluctuating water tables. Soils contain numerous rock fragments and are very gravelly or very cobbly. Stones or boulders can be present at depth in the soil. This component represents 30 percent of the unit.

Compiled by: Annie Greene, Beverhead-Deerlodge National Forest

LTA10-M332E
LTA10-M331Am
LTA10-M331Ap

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the Beaverhead, Anaconda Pintlar, Fleeceer, Pioneer, Lima, Tendoy, and Madison Ranges. These are in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

10-M332E	88,274 (Section except for M332En)
10-M331Am	5,925
10-M331Ap	6,935

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley bottom and alluvial fan landscape setting, which is typically composed of glacial outwash plains, stream terraces, and alluvial fans. Parent materials are undifferentiated deposits of silts, sands, gravels, and cobbles, which can be underlain by any bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep, gravelly loamy sands. The vegetation is a mosaic of deciduous shrubs, deciduous forest, coniferous forest, upland grasslands, and wet meadow. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 1951 to 2804 meters (6400 to 9200 feet). The dominant slope gradients are 0 to 15 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of glacial outwash plains, stream terraces, and alluvial fans.

Glacial outwash fans are formed in relatively coarse alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are shallow to moderately deep, poorly developed, well to excessively drained gravelly loamy sands and sandy loams. Predominant soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than one percent of this landscape component. The dominant potential natural vegetation is mountain big sagebrush and Idaho fescue series. This component represents sixty percent of this land type association.

Stream terraces are formed in mixed alluvium and reworked glacial outwash. Slope gradients range from 0 to 5 percent. Soils on these landforms are shallow to moderately deep, poorly developed, well-drained gravelly loams and sandy loams. Predominant soils are classified as Typic Cryorthents, and Typic Cryochrepts. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is Douglas-fir and mountain big sage series. This component represents 20 percent of this land type association.

Alluvial fans are formed in alluvium. Slope gradients range from 5 to 15 percent. Soils on these landforms are shallow, poorly developed, well-drained gravelly sandy loams. Predominant soils are classified as Typic Cryochrepts, and Typic Cryoborolls. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is mountain big sage. This component represents 20 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA12-M332E

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIUM

Location: This LTA is located in foothills near the Boulder, Highland and Tobacco Root Mountains on the Beaverhead-Deerlodge National Forest. It occurs in the upper Boulder and Jefferson River basins.

Acreage by Subsection

12-M332E 50,641 (Section except for M332En)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley landscape setting, which is typically composed of alluvial fans and glacial terraces. Parent materials are coarse alluvium and glacial outwash over undifferentiated bedrock.

Accessory Characteristics: The primary soils are deep with cobbly sandy and gravelly sandy and loamy textures. The vegetation is a mosaic of shrublands and grasslands with a minor inclusion of coniferous forest. Mean annual precipitation ranges from 23 to 46 centimeters (9 to 18 inches). The elevation range of this LTA is 1373 to 1951 meters (4500 to 6400 feet). The dominant slopes have gradients of 5 to 15 percent. This LTA is moderately to highly dissected by intermittent streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of alluvial fans and glacial terraces.

Alluvial fans are formed in coarse alluvial and glacio-fluvial deposits originating from a variety of bedrock types. The majority of this LTA consists of a series of coalescing alluvial fans. Slope gradients range from 1 to 15 percent. Soils on these landforms are moderately deep to deep, weakly to moderately developed, and have cobbly and gravelly sandy loam and loam surface soils. The subsurface layers are cobbly sandy loams and loams in the less developed soils and cobbly sandy clay loams and clay loams where subsoil clay accumulation occurs. These soils are classified as Ustochrepts, Argiborolls, and Haploborolls. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is needle-and-thread grass/blue grama; bluebunch wheatgrass/blue grama; and sagebrush/bluebunch wheatgrass habitat types. This components represents 95 percent of this LTA.

Glacial terraces are formed in coarse glacio-fluvial deposits. This component is represented by one mapping unit at the mouth of Rock Creek in the upper Boulder River. Slope gradients range from 0 to 20 percent. Soils on this landform are deep, weakly to moderately developed, with cobbly, sandy and loamy textures. They are classified as Typic Cryochrepts and Cryoboralfs, and Argic and Typic Cryoborolls. Rock outcrop does not occur in this landform component. The dominant potential natural vegetation is a mosaic of Douglas fir /twinline, dwarf huckleberry, and pinegrass; sagebrush/rough fescue; and rough fescue/Idaho fescue habitat types. This component represents 5 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA12-M332En

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIUM

Location: This LTA is located throughout the Greenhorn and Gravelly mountain ranges and basins. These are in southwest Montana and are drained by the Ruby and Madison rivers in the Jefferson Basin

Acreage by Section

12-M332En 10,365

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on glacial outwash plains and is comprised glacial till dominated by granite and gneiss. Other undifferentiated competent rock types are present. This till was deposited by meltwater streams beyond the extent of glacial ice.

Accessory Characteristics: The primary soils are moderately deep to very deep, very cobbly to stony, coarse loams and sandy loams. Vegetation varies from shrublands and grasslands to conifers. Minor areas of deciduous forests occur. Elevation ranges from 1951 to 2560 meters (6400 to 8400 feet). Mean annual precipitation is 40 to 75 centimeters (16 to 30 inches). Slopes range 0 to 20 percent, with dominant slopes 5 to 15 percent. This unit is slightly dissected by streams with the stream pattern being dendritic.

LTA Components: This landtype association consists of glacial outwash plains.

Glacial outwash plains are dominated on the surface by undifferentiated stone to boulder size glacial till. Granite and gneiss are the dominant parent materials. Dominant soils are Typic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglass-fir and subalpine fir series, Typic Cryochrepts are present. Slopes range 0 to 20 percent with dominant slopes 5 to 15 percent.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA13-M332En

VALLEYS: FINE GLACIAL SEDIMENTS

Location This LTA is located throughout the Snowcrest and Gravelly mountain ranges and basins in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

13-M332En	12,914

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs on glacial outwash plains and contains glacial till dominated by competent shales, limestones and sandstones. This till was deposited by meltwater streams beyond the extent of glacial ice.

Accessory Characteristics: The primary soils are moderately deep to very deep, very gravelly to very stony loams. Vegetation varies from shrublands, grasslands to conifers. The elevation range is 1951 to 2560 meters (6400 to 8400 feet). Mean annual precipitation is 40 to 76 centimeters (16 to 30 inches). Slope ranges from 0 to 20 percent with dominant slopes of 5 to 15 percent. The unit is moderately to highly dissected by streams with the stream pattern being dendritic.

LTA Components: This landtype association consists of glacial outwash plains.

Glacial outwash plains are dominated on the surface by stone sized glacial till derived from competent shales, limestones and sandstones. Dominant soils are Pachic Cryoborolls and Typic Cryoborolls under mountain big sagebrush, Idaho fescue and Douglas-fir series. Under subalpine fir series, Typic Cryocrepts are present. Slopes range from 0 to 20 percent, with dominant slopes of 5 to 15 percent.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA14-M332En

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges and basins in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

14-M332En 11,728

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in valley bottoms and alluvial basins. The fine alluvium is derived from shale, finegrained sandstone, limestone and related rocks.

Accessory Characteristics: Dominant soils are deep to very deep fine loams to clays. There are minor amounts of organic soils and soils with organic surfaces. The vegetation varies from sedges, willows and wet forb types to conifers with moist undertory forbs. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range is 1860 to 2317 meters (6100 to 7600 feet). The slope range is 0 to 20 percent, with dominant slopes 5 to 15 percent. This LTA is highly dissected by streams, with dominant stream patterns being dendritic.

LTA Components: This landtype association consists of alluvial basins, and valley bottoms.

Alluvial basins are wide openings in a valley bottom drained by a meandering stream and underlain by sediments deposited by running water. The slope range is 0 to 20 percent, with dominant slopes 5 to 15 percent. Dominant soils include Argic Cryoborolls and Argic Pachic Cryoborolls under mountain big sagebrush, Idaho fescue, tufted hairgrass and Douglas-fir series. Under carex and moist forb series soils are Histic Cryaquolls or Histosols. Under spruce and subalpine fir series Typic Cryochrepts are present. All soils can have mottles or gleying present indicating high water tables. This component represent 60 percent of the unit.

Valley bottoms are areas containing the present stream and built of sediment deposited during overflows during flood stages of past and present stream regimes. Slopes range 0 to 20 percent, with dominant slopes 5 to 15 percent. Soils can be poorly developed and include Fluvents and Cryaquolls under carex and willow series. Under mountain big sagebrush, Idaho fescue, tufted hairgrass, and Douglas-fir series; Calcic Pachic Cryoborolls and Typic Cryoborolls are present. Typic Cryochrepts are present under spruce and subalpine fir series. Soils contain numerous rock fragments and are very gravelly to very cobbly. Stones or boulders can be present at depth in the soils. This component represent 40 percent of the unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA14-M332E
LTA14-M331A

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located in the Beaverhead, Anaconda-Pintlar, Flecceer, Pioneer, Lima, Tendoy, and Madison Ranges. These are in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

14-M332E	83,204 (all of Section except M332En)
14-M331A	12,271

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in the larger valley bottoms, which is typically composed of floodplains, glacio-fluvial wetlands, and outwash alluvium. Parent materials are recent alluvium and glacio-fluvial outwash deposits.

Accessory Characteristics: The primary soils are deep with fine textures and organics. The vegetation is a mosaic of riparian deciduous and coniferous forest, riparian shrub meadows and sedge meadows. Mean annual precipitation ranges from 50 to 102 centimeters (20 to 40 inches). The elevation range of this LTA is 2073 to 2896 meters (6800 to 9500 feet). The dominant slopes have gradients of 0 to 10 percent. This LTA is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of floodplains, glacio-fluvial wetlands, and outwash alluvium.

The floodplains are formed in variable alluvium, typically finer and/or organic nearer the surface. Slope gradients range from less than one to four percent. Soils on these landforms are typically deep, weakly to moderately developed, poorly drained sands to silt, often with organic surface soils. These soils are classified as Histic Cryaquolls and Aquic Cryoborolls. Rock outcrop does not occur. The potential natural vegetation is a variety of riparian/wetland communities, such as willow and sedge. This component represents about 50 percent of this LTA.

Alluvial wetlands are formed in relatively fine glacial outwash and sediments, in glaciofluvial valley fill deposits. Slope gradients range from 1 to 10 percent. Soils on these landforms are deep, poorly drained, weakly to moderately developed, silt loams and silty clay loams, often with organic surface soils. These soils are classified as Histic Cryaquolls and Aquic Cumulic Cryoborolls. Rock out crop does not occur in these wetlands, but do occur in the intermingled uplands. The dominant potential natural vegetation is tufted hairgrass series. This component represents about 30 percent of this LTA.

Outwash alluvium is formed in glacial outwash and mixed alluvium and glacial outwash. Slope gradients range from 1 to 15 percent. Soils on these landforms are deep organic soils and deep, poorly drained silt loams and sandy loams. These soils are classified as Sapric Terric Medihemists and Oxyaquic Cryoborolls. Rock outcrop does not occur in this unit. The dominant potential natural vegetation is comprised of various willow and wet meadow communities. Typical potential vegetation is willow and sedges. This component represents about 20 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-DeerLodge National Forest

LTA20-M332E

BREAKS: METASEDIMENTARY (BELTS)

Location: This LTA is located in the Fleecer, Pioneer, Beaverhead, Lima, and Tendoy Ranges. These occur in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

20-M332E	72,264

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings, which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum underlain by metamorphosed sediments of the Precambrian Belt Supergroup undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, and carbonate and sandstone.

Accessory Characteristics: The primary soils are very shallow to moderately deep, channery and flaggy loamy sands to loams. The vegetation is a mosaic of open, coniferous forest and mountain grassland. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 3048 meters (6600 to 10000 feet). The dominant slopes have gradients of 50 to 70 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic and parallel.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 40 to 75 percent. Soils on these landforms are very shallow to shallow, weakly developed, well to excessively drained, channery and flaggy loamy sands to loams. These soils are classified as Lithic and Typic Cryorthents, sandy skeletal to loamy skeletal, mixed; and Lithic and Typic Cryochrepts, loamy skeletal, mixed. Rock outcrop can account for up to a third of this landscape component. The dominant potential natural vegetation is Douglas-fir, big sagebrush, subalpine fir and whitebark pine series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead/Deerlodge National Forest

LTA21-M332E
LTA21-M332D

BREAKS: HIGHLY WEATHERED GRANITICS

Location: This LTA is located in the Anaconda-Pintlar, Fleecer, Pioneer, Boulder, Bull, Highland, and Tobacco Root Mountains on the Beaverhead-Deerlodge National Forest. These occur in southwest Montana in the Jefferson and Madison River Basins.

Acreage by Section

21-M332E	41,402
21-M332D	8,423

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum derived from moderately to highly weathered Cretaceous to Tertiary intrusive rocks undifferentiated, consisting mainly of granite, quartz monzonite, and granodiorite.

Accessory Characteristics: The primary soils are shallow to moderately deep, well drained, gravelly sandy loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 3048 meters (6600 to 10000 feet). The dominant slopes have gradients of 40 to 75 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic to parallel.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 40 to 75 percent. Soils on these landforms are shallow to moderately deep, weakly developed, well drained, channery sandy loams and loams. These soils are classified as Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop accounts for up to a quarter of this landscape component. The dominant potential natural vegetation is Douglas-fir, big sagebrush, subalpine fir, and whitebark pine series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda and Dave Ruppert, Beaverhead-DeerLodge National Forest

LTA23-M332E
LTA23-M331A

BREAKS: SCHIST AND GNEISS

Location: This LTA is located in the Lima Peaks, Tendoy, Tobacco Root, and Madison mountain ranges of the Beaverhead National Forest. These occur in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

23-M332E	23,278
23-M331A	25,213

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum derived from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diorite, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite and migmatite, including the Dillon Granite-Gneiss in the Tendoy Mountains.

Accessory Characteristics: The primary soils are very shallow to moderately deep, well-drained, channery sandy loams and loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 3048 meters (6600 to 10000 feet). The dominant slopes have gradients of 40 to 75 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic to parallel. Wetlands, lakes, and ponds are not a component of this LTA.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 40 to 75 percent. Soils on these landforms are very shallow to moderately deep, well-drained, weakly developed channery sandy loams to loams. These soils are classified as Lithic and Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 25 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, big sagebrush, subalpine fir and whitebark pine series. This component represents 100 percent of LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA25-M332E
LTA25-M331A

BREAKS: SANDSTONES AND SHALES

Location: This LTA is located in the Lima Peaks, Tendoy, Pioneer, Fleecer, and Madison mountains of the Beaverhead/Deerlodge National Forest. These occur in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

25-M332E	45,709
25-M331A	69,798

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a steep, deeply eroded (rejuvenated), or faulted mountainous landscape settings which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum derived from Tertiary to Cambrian sediments undifferentiated consisting of shale, siltstone, sandstone, limestone and calcareous clays. Minor gypsum, chert, and volcanic rock occurs.

Accessory Characteristics: The primary soils are shallow to deep, well drained, flaggy loams, clay loams, and sandy loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 1829 to 3048 meters (6000 to 10000 feet). The dominant slopes have gradients of 35 to 75 percent. This LTA is highly to moderately dissected by streams, with the dominant stream pattern being dendritic to parallel. Wetlands, seeps are a minor component of this LTA.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 20 to 65 percent. Soils on these landforms shallow to deep, well drained, weakly to moderately developed, flaggy loams, clay loams, and sandy loams. These soils are classified as Typic Cryochrepts and Typic Cryumbrepts. Rock outcrop occurs on up to 20 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, low sagebrush, big sagebrush, subalpine fir and whitebark pine series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA27-M331A

BREAKS: VOLCANICS AND CARBONATES

Location: This LTA is located in the Lima Peaks, Tendoy, Pioneer, Fleecer, Tobacco Root, and Madison mountain ranges in the Beaverhead National Forest. These occur in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

27-M332E	62,706
27-M331A	6,506

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, deeply eroded (rejuvenated), or faulted mountainous landscape setting which is typically composed of structural and stream breaks. Parent materials are colluvium and residuum derived largely from volcanics and limestone rocks of various ages.

Accessory Characteristics: The primary soils are shallow to moderately deep, well-drained channery loams. The vegetation is a mosaic of mountain grasslands and open coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2012 to 2591 meters (6600 to 8500 feet). The dominant slopes have gradients of 55 to 75 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being dendritic to parallel. Wetlands and seeps are a minor component of this LTA.

LTA Components: This landtype association consists of breaks.

Breaks are formed in colluvium and residuum. Slope gradients range from 45 to 85 percent. Soils on these landforms are shallow, well drained, weakly developed, channery loams. These soils are classified as Lithic and Typic Cryochrepts. Rock outcrop occurs on about one third of this landscape component. The dominant potential natural vegetation is low sagebrush, curlleaf mountain mahogany and Douglas-fir series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-DeerLodge National Forest

LTA34-M332En

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges which are drained by the Ruby and Madison Rivers in the Jefferson River Basin

Acreage by Subsection

34-M332En 9,181

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glacial mountain slopes and is composed of colluvium derived from rhyolitic volcanic flows, welded tuffs, and andesitic porphyry, and basalts.

Accessory Characteristics: Dominant soils are moderately deep to very deep gravelly and very cobbly loams. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation is 51 to 102 centimeters (20 to 40 inches). Elevation ranges from 1951 to 2744 meters (6400 to 9000 feet). Slopes range from 40 to greater than 70 percent, with dominant slopes being 40 to 60 percent. This LTA is moderately to highly dissected with streams dominantly having a parallel stream pattern.

LTA Components: This landtype association consists of steep mountain slopes.

Steep mountain slopes are formed in colluvium derived from rhyolitic volcanic flows, welded tuffs and andesites. Slopes range from 40 to over 70 percent, with slopes of 40 to 60 percent predominating. Soils are moderately deep to deep with numerous rock fragments. Dominant soils include Typic Cryoborolls under mountain big sagebrush, Idaho fescue and Douglas-fir series and Typic Cryochrepts under subalpine fir and whitebark pine series. Rock outcrop occurs on 10 to 30 percent of this unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA35-M332En

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES QUARTZITES

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges which are drained by the Ruby and Madison Rivers in the Jefferson River Basin

Acreage by Subsection

35-M332En 19,160

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both glacial and non-glacial mountain slopes and is composed of moderate to steep mountain slopes, glacial trough walls and ridge tops. Soils formed in colluvium and residuum derived from (non-Belt) Paleozoic quartzites. Minor amounts of sandstone and associated cherts are included.

Accessory Characteristics: Dominant soils are shallow to deep coarse sandy to loams with numerous rock fragments. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). Elevation ranges 2134 to 2927 meters (7000 to 9600 feet). Slopes range from 20 to greater than 60 percent, with dominant slopes 30 to 50 percent. This LTA is moderately to highly dissected with streams dominantly having a parallel stream pattern.

LTA Components: This landtype association consists of moderate to steep mountain slopes, ridge tops, and glacial trough walls.

Moderate to steep mountain slopes formed in colluvium derived from quartzites and minor amounts sandstone and associated cherts. Slopes range 20 to +60 percent, with dominant slopes 30 to 50 percent. Soils are moderately deep on steeper slope gradients. Dominant soils include Typic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass. Typic Cryochrepts occur under Douglas-fir, subalpine fir, and whitebark pine series. Dystric Cryochrepts and Typic Cryumbrepts also occur under whitebark pine series. Rock outcrop accounts for 5 to 20 percent of this component. This component represents 50 percent of the map unit

Ridge tops are formed in residuum derived from quartzites, sandstones and associated cherts. Soils are moderately deep to deep. There are minor amounts of very shallow to shallow soils. Slopes range from 0 to 20 percent, with dominant slopes 5 to 15 percent. Dominant soils include Typic Cryoborolls under Idaho fescue and tufted hairgrass series. Typic Cryumbrepts occur under alpine tundra and whitebark pine habitat types. Under subalpine fir series there are Typic Cryochrepts. Rock outcrop accounts for 5 to 20 percent of this component. This component represents 20 percent of the unit

Glacial trough walls are slopes of glacial eroded valleys. Soils are shallow to moderately deep. Slopes range from 40 to +60 percent with dominant slopes 40 to 60 percent. Dominant soils are Typic Cryochrepts under subalpine fir and whitebark pine series. Rock outcrop and talus accounts for 20 to 40 percent of this component. This component represents 20 percent of the map unit.

Compiled by: Annie Greene, Beaverhead-DeerLodge National Forest

LTA36-M332En

HIGH RELIEF MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Snowcrest and Gravelly mountains in southwest Montana which are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

36-M332En 6,646

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated steep mountain slopes in colluvium derived from Mesozoic shales and siltstones with minor amounts of interbedded sandstone.

Accessory Characteristics: Dominant soils are moderately deep to deep loams to clays with numerous rock fragments. The vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). Elevations range from 2256 to 2866 meters (7400 to 9400 feet). Slopes range 45 to greater than 80 percent, dominant slopes are 50 to 70 percent. This unit is highly dissected by streams, with dominant stream patterns being parallel.

LTA Components: This landtype association consists of steep mountain slopes.

Steep mountain slopes formed in colluvium. Slopes range from 45 to +80 percent; dominant slopes are 50 to 70 percent. Soils are moderately deep to deep. Dominant soils include Typic Cryoborolls and Argic Cryoborolls under mountain big sagebrush, bluebunch wheatgrass, and Idaho fescue series. Typic Cryochrepts occur under limber pine, Douglas-fir, subalpine fir and whitebark pine series. Rock outcrops occur on 5 to 20 percent of this unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA37-M332En

HIGH RELIEF MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located throughout the Snowcrest, Gravelly and Greenhorn mountains in southwest Montana which are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

37-M332En 33,777

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of steep mountain slopes and ridge tops. Parent materials are colluvium derived from Cretaceous, Triassic, Paleozoic limestones with minor amounts of interbedded calcareous shales, Archaean marbles and dolomites.

Accessory Characteristics: Dominant soils are moderately deep to deep loamy soils with numerous rock fragments. The vegetation varies from mountain shrublands, grasslands, and conifers to alpine tundra. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). Elevations range 2134 to 2927 meters (7000 to 9600 feet). Slopes range from 45 to over 80 percent, with dominant slopes 50 to 70 percent. This unit is moderately to highly dissected by streams, with dominant stream patterns being dendritic to parallel.

LTA Components: This landtype association consists of steep mountain slopes, and ridge tops.

Steep mountain slopes formed in colluvium. Slopes range from 45 to +80 percent, with dominant slopes 50 to 70 percent. Soils are moderately deep to deep. Dominant soils include Calcic Cryoborolls and Argic Cryoborolls under mountain big sagebrush, bluebunch wheatgrass, Idaho fescue, limber pine and lower elevation Douglas-fir series. Under subalpine fir and white-bark pine series the dominant soils are Typic Cryoboralfs and Typic Cryochrepts. Rock outcrops occur on 5 to 20 percent of this component. This component represents 80 percent of this unit.

Ridge tops formed in residuum. Slope gradients range 2 to 30 percent. Soils are shallow to deep. Dominant soils are Lithic Cryoborolls and Calcic Cryoborolls under tufted hairgrass series and alpine tundra. Under whitebark pine series, soils are Lithic Cryochrepts and Typic Cryochrepts. Rock outcrop occurs on 5 to 20 percent of this component. This component represents 20 percent of this map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA39-M332E

STEEP GLACIATED MOUNTAIN SLOPES: GNEISSES AND SCHISTS

Location: This LTA is located in the Tobacco Root Mountains of the Beaverhead-Deerlodge National Forest in southwest Montana in the Jefferson River Basin.

Acreage by Subsection

39-M332E 27,957 (Section except for M332En)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of cirques and troughs. Parent materials are residuum underlain by gneiss and schist bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly sandy textures. The vegetation is a mosaic of rock outcrop, scree, and coniferous forest. Mean annual precipitation ranges from 46 to 127 centimeters (18 to 50 inches). The elevation range of this LTA is 1829 to 3232 meters (6000 to 10600 feet). The dominant slopes have gradients of 60 to 100 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being trellis. Wetlands are a major component of cirque basins and trough bottoms which are inclusions within this LTA.

LTA Components: This landtype association consists of cirques and troughs.

Cirques are formed in gneiss and schist bedrock. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly sandy textures. These soils are classified as Lithic and Typic Cryorthents and Cryochrepts. Rock outcrop and scree occur on 40 to 90 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine series. This component represents 20 percent of this LTA.

Troughs are formed in gneiss and schist bedrock. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly sandy textures. These soils are classified as Lithic and Typic Cryorthents and Cryochrepts. Rock outcrop and scree occurs on 30 to 75 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, subalpine fir, and subalpine fir-whitebark pine series. This component represents 80 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA39-M332En

STEEP GLACIATED MOUNTAIN SLOPES: GNEISS

Location: This LTA is located in the Snowcrest, Greenhorn and Gravelly mountain ranges in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

39-M332En 7,063

LTA Setting and Characteristics:

Differentiating Characteristics: This map unit occurs in steep glaciated mountains and is composed of cirque headwalls and glacial trough walls. Parent material is residuum and colluvium derived from Precambrian gneiss, schist, phyllites, amphibolites, metasedimentary rocks and minor components of gabbro sills and marble.

Accessory Characteristics: Dominant soils are shallow to deep coarse sandy loams to loams with numerous rock fragments. The vegetation varies from shrublands, grasslands to conifers. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). Elevation ranges from 2134 to 3201 meters (7000 to 10500 feet). Slopes range from 30 to greater than 70 percent. This unit is highly dissected by streams, with dominant stream patterns being parallel.

LTA components: This landtype association consists of cirque headwalls and glacial trough walls.

Cirque headwalls are steep rocky walls around a cirque basin formed by glacial erosion. Slopes range 40 to greater than 70 percent, with dominant slopes 45 to 60 percent. Soils are shallow to moderately deep with weak development. Numerous rock fragments are present. Dominant soils under mountain big sagebrush and Idaho fescue series are Typic Cryoborolls. Under Douglas-fir, subalpine fir and whitebark series; Typic Cryochrepts occur. Typic Cryumbrepts are present under whitebark pine series and alpine tundra.

Glacial trough walls slopes of glacially eroded valleys. Slopes range from 30 to over 70 percent. with dominant slopes 40 to 60 percent. Soils are shallow to moderately deep on upper trough walls and moderately deep to deep on lower troughwalls. Soils are weakly developed and have numerous rock fragments. Dominant soils under mountain big sagebrush and Idaho fescue series are Typic Cryoborolls. Under Douglas-fir, subalpine fir series and white-bark pine habitat types; Typic Cryochrepts occur. Typic Cryumbrepts are present under whitebark pine series and alpine tundra.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA40-M332E
LTA40-M331A

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELTS)

Location: This LTA is located in the Lima Peaks, Pioneers, Beaverhead, and Madison mountain ranges in the Beaverhead National Forest. These are located in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

40-M332E	100,569
40-M331A	626

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a steep, glacial landscape setting which is typically composed of glacial headwalls and troughwalls. Narrow, V-shaped trough valley bottoms and cirque basins are described under Glaciated Mountain Slopes, LTA 50. Parent materials are metamorphosed sediments of the Precambrian Y Belt Supergroup undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are shallow, flaggy, cobbly, or gravelly loamy sands and sandy loams. The vegetation is a mosaic of coniferous forest, alpine turf, and rockland. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2256 to 3231 meters (7400 to 10600 feet). The dominant slopes have gradients of 50 to 70 percent. This LTA is highly to moderately dissected with the dominant pattern being parallel. Wetlands/seeps are a minor component of this LTA.

LTA Components: This landtype association consists of cirque headwalls, and troughwalls.

Headwalls are formed in metasediment bedrock. They usually have well-developed avalanche chutes and rock glaciers/scree. Slope gradients range from 50 to 90 percent. Soils on these landforms are very shallow, weakly developed, flaggy loamy sands and loams. These soils are classified as Lithic and Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 75 percent of this landscape component. The dominant potential natural vegetation is whitebark pine, and whitebark pine-subalpine fir series. This landform component represents about 15 percent of this LTA.

Troughwalls are formed in metasediment bedrock. They have thin to thick till deposits, and often have developed avalanche chutes. Slope gradients range from 45 to 70 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, gravelly and cobbly loamy sands, sandy loams, and loams. These soils are classified as Lithic and Typic Cryochrepts, and Entic and Typic Cryumbrepts. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, and subalpine fir series. This landform component represents about 85 percent of this LTA.

Compiled by: Daniel J. Svoboda, Beaverhead-Deerlodge National Forest

LTA41-M332E

STEEP GLACIATED MOUNTAIN SLOPES: GRANITIC

Location: This LTA is located in the Anaconda-Pintlar, Fleece, Pioneer, Lima Peaks, and Tobacco Root mountains in the Beaverhead/Deerlodge National Forest. These occur in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

41-M332E	129,472

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a steep, glacial landscape setting which is typically composed of glacial headwalls and troughwalls. Narrow, V-shaped trough valley bottoms and cirque basins are described under glaciated Mountain Slopes: Granitics, LTA 51. Parent materials are Cretaceous to Tertiary plutonic intrusive undifferentiated, consisting mainly of granite, quartz, monzonite, and granodiorite.

Accessory Characteristics: The primary soils are shallow to moderately deep, stony, cobbly, and gravelly sandy loams and loams. The vegetation is a mosaic of coniferous forest and mountain grasslands with open stands of coniferous forest. Mean annual precipitation ranges from 46 to 102 centimeters (18 to 40 inches). The elevation range of this LTA is 2134 to 3048 meters (7000 to 10000 feet). The dominant slopes have gradients of 50 to 70 percent. This LTA is highly to moderately dissected by streams, with the dominant pattern being parallel. Wetlands and seeps are a minor component of this LTA.

LTA Components: This landtype association consists of cirque headwalls and troughwalls.

Headwalls are formed in granitic bedrock. They usually have well developed avalanche chutes and rock glaciers/scree. Slope gradients range from 50 to 90 percent. Soils on these landforms are very shallow and shallow, weakly developed, gravelly and cobbly loamy sands and loams. These soils are classified as Lithic and Typic Cryorthents, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 75 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, and subalpine fir series. This landform component represents about 15 percent of this LTA.

Troughwalls are formed in granitic bedrock. They have thin to deep till deposits, and often have well-developed avalanche chutes. Slope gradients range from 45 to 70 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, gravelly and cobbly loamy sands, sandy loams, and loams. These soils are classified as Lithic and Typic Cryochrepts. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, and subalpine fir series. This landform component represents about 85 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA42-M332Ea

STEEP GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Little Blackfoot River Drainage. This unit serves to break out areas influenced by extrusive volcanics from those affected by Belt Series rocks.

Acreage by Subsection

42-M332Ea 4,793

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in an alpine glaciated mountainous landscape setting which is typically composed of glacial trough walls and cirque basins and headwalls. Parent material is glacial till underlain by weakly weathered andesite and other volcanic rocks.

Accessory Characteristics: Northerly aspects and high elevation cirques have volcanic ash influenced surface soils. The primary soils are deep (except where glacially scoured in the cirques) and medium to moderately fine textured. The vegetation is a mosaic of coniferous forest and forested scree. Mean annual precipitation ranges from 50 to 113 centimeters (20 to 45 inches). The elevation range of this LTA is 1586 to 2898 meters (5200 to 9500 feet). The dominant slopes have gradients of 25 to 90 percent. This LTA is moderately dissected (moderately to widely spaced drainages) and weakly incised by streams, with the dominant stream patterns being parallel and subparallel.

LTA Components: This landtype association consists of glacial trough walls, and cirque basins and headwalls.

Glacial trough walls are formed in andesite and other volcanic rock. Slope gradients range from 60 to 90 percent. Soils on these landforms are deep or very deep, weakly to moderately developed, and have silt loam, cobbly silt loam or cobbly loam surfaces and very cobbly loam subsurface layers. These soils are classified as Typic Ustochrepts, Andic Cryochrepts and Typic Cryoboralfs. Clay development is greater on the more moderate slopes and in areas influenced by excess moisture. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir series on the south aspects, and subalpine fir series on north aspects. This component represents 75 percent of this LTA.

Cirque basins and headwalls are formed in andesite and other volcanic rock. Slope gradients range from 25 to greater than 60 percent. Soils on these landforms range from very shallow to very deep, are weakly developed, and have loamy surfaces and very cobbly or stony loam subsurface layers. These soils are classified as Andic Cryochrepts and Cryoboralfs. Rock outcrop occurs on about 65 percent of this landscape component. The dominant potential natural vegetation in the cirque basins is subalpine fir series. The glacially scoured headwalls are often barren or support grass/shrub vegetation. This component represents 25 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA42-M332En

STEEP GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

42-M332En	3,298

LTA Setting and General Characteristic:

Differentiating Characteristics: This map unit occurs in steep glaciated mountains and is composed of cirque headwalls and glacial trough walls. Parent material is residuum and colluvium derived from rhyolitic ash-flow tuffs, welded tuffs, andesitic porphyry and basalts.

Accessory Characteristics: Dominant soils are shallow to deep loams with numerous rock fragments. The vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation is 51 to 102 centimeters (20 to 40 inches). Elevation ranges from 2134 to 3201 meters (7000 to 10500 feet). Slopes range from 30 to greater than 70 percent, with dominant slopes of 40 to 60 percent. This unit is highly dissected by streams, with dominant stream patterns being parallel.

LTA Components: This landtype association consists of cirque headwalls, and glacial trough walls.

Cirque headwalls are rocky steep walls around cirque basins formed by glacial erosion. Slopes range 40 to greater than 70 percent with dominant ranges 45 to 60 percent. Soils are shallow to moderately deep with weak development. Numerous rock fragments are present. Dominant soils are Typic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir series and whitebark pine habitat types; Typic Cryochrepts are present. Rock outcrop, rock glaciers and talus occur on 20 to 40 percent of this component. This component represents 20 percent of this map unit.

Glacial troughwalls are formed in residuum and colluvium. Slopes range from 30 to greater than 70 percent, dominant slopes are 40 to 60 percent. Soils are shallow to moderately deep on upper trough walls and moderately deep to deep on lower trough walls. Soils are weakly developed and have numerous rock fragments. Dominant soils are Typic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir, and white-bark pine series Typic Cryochrepts occur. Rock outcrop, rock glaciers and talus occur on 20 percent of this component. This component represents 80 percent of the map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA43-M332Eb
LTA43-M332B

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located in the Anaconda and Flint Ranges, and Fleecer Mountains on the Beaverhead-Deerlodge National Forest, southwest Montana, in the upper Clark Fork River Basin.

Acreage by Subsection

43-M332Eb	3,012
43-M332B	77,618

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of cirques, troughs, and moraines. Parent materials are residuum underlain by limestone and glacial moraines deposited on limestone and a variety of other bedrock types.

Accessory Characteristics: The primary soils are shallow to deep with cobbly loamy textures. The vegetation is a mosaic of grasslands, shrublands, and coniferous forest. Mean annual precipitation ranges from 51 to 127 centimeters (20 to 50 inches). The elevation range of this LTA is 1829 to 3049 meters (6000 to 10000 feet). The dominant slopes have gradients of 25 to 80 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of cirques and troughs, and moraines.

Cirques and troughs are formed in limestone bedrock. Slope gradients range from 45 to 100 percent. Soils on these landforms are shallow and moderately deep, weakly developed, with cobbly loamy textures. These soils are classified as Typic and Lithic Cryorthents and Cryochrepts. Rock outcrop occurs on 30 to 90 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 40 percent of this LTA.

Moraines are composed of glacial deposits. Slope gradients range from 0 to 35 percent. Soils on these landforms are deep, moderately developed, with cobbly loamy textures. These soils are classified as Typic Cryochrepts and Cryoboralfs. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is sagebrush, Douglas-fir, and subalpine fir series. The dominant vegetation in wetlands is willow, sedge, and subalpine fir series. This component represents 60 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA43-M332E

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located throughout the Snowcrest and Gravelly mountains of southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

43-M332E 6,435 (Section except for M332Eb)

LTA Setting and General Characteristic:

Differentiating Characteristics: This map unit occurs in gentle to steeply sloping glaciated mountains and is composed of cirque headwalls, glacial trough walls, cirque basins, moraines and trough valley bottoms. Parent material is residuum and colluvium derived from Cretaceous, Triassic, and Paleozoic limestones with minor amounts of interbedded calcareous shales, Archean marbles, dolomites and associated cherts.

Accessory Characteristics: Dominant soils are shallow to deep, loams to clay loams. Numerous rock fragments are present with stone to boulder size glacial till. Soils with organic surfaces and organics occur in depressional areas under sedges and moist forbs. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation is 51 to 102 cms (20 to 40 inches). Elevation ranges from 2134 to 2866 (7000 to 9400 feet). Slopes range from 0 to greater than 70 percent, with dominant slopes of 10 to 60 percent. This unit is moderately to highly dissected by streams. The dominant stream patterns are dendritic to parallel, depending on slope.

LTA Components: This landtype association consists of cirque headwalls glacial trough walls, cirque basins, moraines, and trough valley bottoms.

Cirque headwalls are steep rocky walls around a cirque basin formed by glacial erosion. Slopes range 40 to greater than 70 percent with dominant ranges being 45 to 60 percent. Soils are shallow to moderately deep with weak development. Numerous rock fragments are present. Dominant soils are Typic Cryoborolls and Calcic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir and white-bark pine series, Typic Cryochrepts are present. Rock outcrop, rock glaciers and talus occur on 20 to 40 percent of this component. This component represents 15 percent of this map unit.

Glacial trough walls are slopes of glacially eroded valleys. Slopes range from 30 to greater than 70 percent with the dominant slopes being 40 to 60 percent. Soils are shallow to moderately deep on upper trough walls and moderately deep to deep on lower trough walls. Soils are weakly developed and have numerous rock fragments. Dominant soils are Typic Cryoborolls and Calcic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir and white-bark pine series, Typic Cryochrepts occur. Rock outcrop, rock glaciers and talus occur on 20 percent of this component. This component represents 30 percent of the map unit.

Cirque basins are large hollows scooped out at the head of valleys by glacial erosion. Soils are moderately deep to deep. Slopes range from 0 to 30 percent with dominant slopes being 5 to 20 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue, and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoborolls and Typic Cryochrepts occur under Douglas-fir, subalpine fir and white-bark pine series. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30

percent of this component. This component represents 15 percent of this map unit.

Moraines are undulating areas formed by glacial drift. Soils are moderately deep to deep. Slopes range from 0 to 50 percent with dominant slopes being 5 to 35 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forbs. Typic Cryoboralfs and Typic Cryochrepts occur under Douglas-fir, subalpine fir, and white-bark pine series. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 25 percent of this map unit.

Trough valley bottoms formed in glacio-fluvial sediments. Soils are deep. Slopes range from 0 to 20 percent with dominant slopes being 5 to 15 percent. Dominant soils include Typic Cryoborolls, Typic Cryaquolls, and Fluvents under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forbs. Typic Cryochrepts and Fluvents occur under Douglas-fir, subalpine fir and white-bark pine series. This component represents 15 percent of this map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA44-M332En

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Snowcrests and Gravelly mountain ranges in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

44-M332En	3,894

LTA Setting and General Characteristics:

Differentiating Characteristics: This map unit occurs in a steep glaciated mountains and is composed of cirque headwalls and glacial trough walls. Parent material is residuum and colluvium derived from Mesozoic shales and siltstones with minor amounts of interbedded sandstone.

Accessory Characteristics: Dominant soils are shallow to deep loams to clay loams with numerous rock fragments. The vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). Elevations range from 2134 to 2927 meters (7000 to 9600 feet). Slopes range from 30 to greater than 70 percent, dominant slopes are 40 to 60 percent. This unit is highly dissected by streams, with dominant stream patterns being parallel.

LTA Components This landtype association consists of cirque headwalls, and trough walls.

Cirque headwalls are walls around a cirque basin formed by glacial erosion. Slopes range 40 to greater than 70 percent with dominant slopes 45 to 60 percent. Soils are shallow to moderately deep with weak development. Numerous rock fragments are common. Dominant soils are Typic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir and whitebark pine series Typic Cryochrepts occur. Rock outcrop, rock glaciers and talus occur on 20 to 40 percent of this component. This component represents 20 percent of this map unit.

Glacial trough walls are slopes of glacially eroded valleys. Slopes range from 30 to over 70 percent; dominant slopes are 40 to 60 percent. Soils are shallow to moderately deep on upper trough walls and moderately deep to deep on lower trough walls. Soils are weakly developed and have numerous rock fragments. Dominant soils are Typic Cryoborolls and Calcic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir and whitebark pine series Typic Cryochrepts are present. Typic Cryumbrepts are found under whitebark pine series and alpine tundra. Rock outcrop, rock glaciers, and talus occur on 20 to 40 percent of this component. This component represents 80 percent of this map unit.

Compiled by: Annie Greene, Beaverhead/Deerlodge National Forest

LTA44-M332E
LTA44-M331A

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Pioneer, Fleecer, Lima, Tendoy, Tobacco Root, and Madison Ranges. These are drained by the Beaverhead, Big Hole, Red Rock, Ruby, and Madison rivers in the Jefferson and Madison Basins.

Acreage by Section

44-M332E	29,909 (Section except for M332En)
44-M331A	17,976

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a steep, glacial landscape setting which is typically composed of glacial headwalls and troughwalls. Narrow, V-shaped trough valley bottoms and cirque basins are described under Glaciated Mountain Slopes, LTA 53. Parent materials are Tertiary to Cambrian sediments undifferentiated, consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rock occurs.

Accessory Characteristics: The primary soils are shallow to deep, stony, loams to clay loams. The vegetation is a mosaic of mountain grassland and open coniferous forest. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range of this LTA is 2134 to 3231 meters (7000 to 10600 feet). The dominant slopes have gradients of 25 to 70 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands/seeps are a minor component of this LTA.

LTA Components: This landtype association consists of headwalls and troughwalls.

Headwalls are formed in residuum. Slope gradients range from 45 to 70 percent. Soils on these landforms are shallow to moderately deep, weakly developed, stony loams to clay loams. These soils are classified as Typic and Alfic Cryochrepts. Rock outcrop occurs on about 25 percent of this landscape component. The dominant potential natural vegetation is mountain big sage, Douglas-fir, and whitebark pine-subalpine fir series. This component represents 15 percent of this LTA.

Troughwalls are formed in residuum. Slope gradients range from 25 to 70 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, cobbly loams and clay loams. These soils are classified as Typic and Alfic Cryochrepts, and Lithic and Typic Cryoborolls. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is mountain big sage, Douglas-fir, and subalpine fir series. This component represents about 85 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA45-M332E
LTA45-M332B
LTA45-M333D

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES: GRANITE

Location: This unit is located in the Bitterroot and Sapphire mountain ranges of western Montana in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

45-M332E	2,117
45-M332B	83,690
45-M333D	3,610

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation broad ridgetop position which is typically composed of weakly expressed glaciated slopes and basins that were formed by ice cap glaciers, minor valley glaciers, and strong periglacial frost shattering. Parent materials are a complex of frost shattered residuum and colluvium, intermixed with glacial till derived from moderately weathered granite.

Accessory Characteristics: The primary soils are shallow to deep, coarse soils with numerous rock fragments and have a volcanic ash surface layer. The vegetation is a mosaic of coniferous forest, stunted wind-deformed forest, and occasional small wet meadows. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 2073 to 2743 meters (6800 to 9000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of weakly developed glacial cirques and frost shattered mountain ridge tops.

Weakly developed glacial cirques are formed in residuum, colluvium, and till derived from a variety of rock types. Slope gradients range from 20 to 55 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of extremely bouldery loam volcanic ash surface layers overlying very stony loamy sand substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir series. This component represents 65 percent of this unit.

Frost shattered mountain ridge tops are formed in residuum and colluvium. Slope gradients range from 20 to 50 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of very stony loam volcanic ash surface layers overlying very cobbly coarse sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, alpine larch-subalpine fir, and subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA50-M332E

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This LTA is located in the Highland, Beaverhead and Pioneer Ranges on the Beaverhead/Deerlodge National Forest. These are drained by the Big Hole and Jefferson Rivers in the Jefferson Basin.

Acreage by Section

50-M332E 105,881

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a gently to moderately sloping glaciated landscape setting, which is typically composed of cirque basins and trough bottoms, glaciated slopes, and moraine. Parent materials are undifferentiated glacial drift, colluvium and residuum comprised of metamorphosed sediments of the Precambrian Y Belt Supergroup undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are moderately deep, somewhat poorly drained, loams and clay loams; and shallow to moderately deep, well drained, gravelly and cobbly sandy loams. The vegetation is a mosaic of coniferous forest, alpine and subalpine grassland and mountain grasslands. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 1981 to 2987 meters (6500 to 9800 feet). The dominant slopes have gradients of 5 to 35 percent. This LTA is variably dissected by streams, with the dominant stream pattern being dendritic across the glaciated slopes, to deranged in the glacial till deposits. Wetlands, seeps, and ponds are a major component of this LTA.

LTA Components: This landtype association consists of cirque basins and narrow trough bottoms, glaciated slopes, and moraine.

Cirque basins and narrow trough bottoms are formed in metasediment bedrock and relatively thin glacial deposits. Slope gradients range from 5 to 35 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately well developed, rocky, well-drained sandy loams and loams on upland positions, and somewhat poorly drained loams and clay loams on lower surfaces. These soils are classified as Lithic and Typic Cryochrepts, and Aquic and Oxyaquic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir and sedge series. This component represents about 20 percent of this LTA.

Glaciated slopes are formed in metasediment residuum and relatively thin glacial till. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep, weakly to moderately developed, loams and sandy loams. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on up to 35 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents about 60 percent of this LTA.

Glacial moraine is composed of metasedimentary till deposits. Slope gradients range from 0 to 35 percent. soils on these landforms are shallow to moderately deep, weakly to moderately developed, gravelly and stony loams and sandy loams. These soils are classified as Dystric and Typic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir, and subalpine fir series. This component represents about 20 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA51-M332E
LTA51-M332D
LTA51-M331A

GLACIATED MOUNTAIN SLOPES: HARD INTRUSIVE ROCKS

Location: This unit is located in the Gallatin, Madison, and Absaroka-Beartooth mountain ranges in southwestern Montana.

Acreage by Section

51-M332Ea	11,348
51-M332Ec	2,406
51-M332Ej	5,779
51-M332Er	546
51-M332D	98,649
51-M331A	760

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of gently to moderately steep glacial moraine. Soil parent material is glacial till derived from coarse grained, shallow intrusive rocks.

Accessory Characteristics: Vegetation is sparse to dense upper to lower subalpine forest, Douglas-fir forest, or mountain grassland. Elevation ranges from 1981 to 2743 meters (6500 to 9000 feet). Mean annual precipitation is 50 to greater than 125 centimeters (20 to greater than 50 inches). Slopes range from 0 to 40 percent.

LTA Components: This landtype association has three components:

Where vegetation is grassland, soils are Typic Cryoborolls and Argic Cryoborolls. These soils are deep, moderately coarse to medium textured, rocky, and have moderate fertility and water holding capacity. Rock outcrop makes up five percent of this component. Common potential natural vegetation include big sagebrush and Douglas-fir series. This component makes up 15 percent of the LTA.

Where vegetation is lower subalpine forest with some Douglas-fir forest, soils are Typic Cryochrepts. These soils are moderately coarse texture, rock, and have low fertility and water holding capacity. Rock outcrop makes up 10 percent of this component. Common potential natural vegetation is subalpine fir and Douglas-fir series. This component makes up 50 percent of the LTA.

Where vegetation is upper subalpine forest, soils are Cryochrepts intermixed with some Cryumbrepts. These soils are deep to moderately shallow, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 to 40 percent of this component. Common potential natural vegetation is subalpine fir, whitebark pine and Idaho fescue series. This component makes up 35 percent of the LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA51-M332E

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This LTA is located in the Anaconda-Pintlar, Fleece, Pioneer, and Tobacco Root Ranges, Boulder and Highland Mountains on the Beaverhead/Deerlodge National Forest. These are drained by the Big Hole, Beaverhead, Jefferson and Madison rivers in the Jefferson and Madison Basins.

Acreage by Section/Subsection

51-M332Eb	13,668
51-M332Ee	39,685
51-M332Eg	44,130
51-M332Ek	7,918

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a gently to moderately sloping glaciated landscape setting, which is typically composed of cirque basins and trough bottoms, glaciated slopes, and moraine. Parent materials are undifferentiated glacial drift, colluvium and residuum comprised of Cretaceous to Tertiary plutonic intrusives, undifferentiated, consisting mainly of granite, quartz, monzonite, and granodiorite.

Accessory Characteristics: The primary soils are moderately deep, somewhat poorly drained loams and clay loams; and shallow to moderately deep, well drained gravelly and cobbly sandy loams. The vegetation is a mosaic of coniferous forest, alpine and subalpine grassland, and mountain grassland. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 1829 to 2987 meters (6000 to 9800 feet). The dominant slopes have gradients of 5 to 35 percent. This LTA is variably dissected by streams, with the dominant stream pattern being dendritic across the glaciated slopes, to deranged in the glacial till deposits. Wetlands, seeps, and ponds are a major component of this LTA.

LTA Components: This landtype association consists of cirque basins and narrow trough bottoms, glaciated slopes, and moraine.

Cirque basins and narrow trough bottoms are formed in granitic bedrock and relatively thin glacial deposits. Slope gradients range from 5 to 60 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately well developed, well drained gravelly loamy sands, sandy loams, and loams in upland positions, and somewhat poorly drained sandy loams and loams in depressions and bottoms. These soils are classified as Lithic and Typic Cryochrepts, and Aquic and Oxyaquic Cryochrepts. Rock outcrop occurs on 15 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir and spruce series. This component represents about 20 percent of this LTA.

Glaciated slopes are formed in granitic residuum and relatively thin glacial till. Slope gradients range from 10 to 60 percent. Soils on these slopes are moderately deep, weakly to moderately developed sandy loams, loams, and clay loams. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential vegetation is Douglas-fir, subalpine fir, and whitebark pine-subalpine fir series. This landscape component represents about 60 percent of this LTA.

Glacial moraine is comprised of granitic till deposition. Slope gradients range from less than 2 to 35 percent. Soils on these landforms are shallow to

moderately deep, weakly to moderately developed. gravelly and stony loamy sands, sandy loams, and loams. These soils are classified as Dystric and Typic Cryochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir, and subalpine fir series. This landscape component represents about 20 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA53-M332En

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges and basins in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

53-M332En 6,396

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in gentle to moderately sloping glaciated mountains. It is composed of cirque basins, moraines and trough valley bottoms. Parent materials Mesozoic shales and siltstones with minor interbedded sandstone, Proterozoic shale and inclusions of quartzite and chert.

Accessory Characteristics: Dominant soils are moderately deep to deep loams to clay loams. Numerous rock fragments are present with cobble to stone size glacial till on the surface. Soils with organic surfaces and organics occur in depressional areas under sedges and moist forbs. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). Elevation ranges from 2134 to 2805 meters (7000 to 9200 feet). Slopes range from 0 to 50 percent; dominant slopes are 10 to 30 percent. This unit is moderately to highly dissected by streams, with dominant stream patterns being dendritic.

LTA Components: This landtype association consists of cirque basins, moraines and trough valley bottoms.

Cirque basins are large hollows scooped out of the heads of valleys by glacial erosion. Soils are moderately deep to deep. Slopes range 0 to 30 percent with dominant slopes 5 to 20 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoboralfs and Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Cobble to stone size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 30 percent of this map unit.

Moraines are undulating areas formed by glacial till. Soils are moderately deep to deep. Slopes range 0 to 50 percent; with dominant slopes 5 to 35 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue, and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoboralfs and Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Cobble to stone size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 40 percent of this map unit.

Trough valley bottoms formed in glacial-fluvial sediments. Soils are deep. Slopes range 0 to 20 percent, with dominant slopes 5 to 15 percent. Dominant soils include Typic Cryoborolls, Typic Cryaquolls, and Fluvents under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryochrepts and Fluvents occur under Douglas-fir, subalpine fir and whitebark series. This component represents 20 percent of this map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA53-M332E

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Lima Peaks (Bitterroot Range, Beaverhead Mountains), and Fleece Mountains of the Beaverhead/Deerlodge National Forest in southwest Montana. These mountains are drained by Horse Prairie, Red Rock, Beaverhead, Big Hole, Ruby, and Madison rivers in the Jefferson and Madison Basins.

Acreage by Section

53-M332E 34,575 (Section except for M332En)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a gently to moderately sloping glaciated landscape setting, composed of cirque basins and trough bottoms, glaciated slopes, and moraine. Parent materials are Tertiary to Cambrian sediments undifferentiated, consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rock occurs.

Accessory Characteristics: The primary soils are shallow, rocky loams on ridges; moderately deep silt loams and silty clay loams in swales. The vegetation is a mosaic of coniferous forest, alpine and subalpine grassland, and mountain grasslands. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 1981 to 2987 meters (6500 to 9800 feet). The dominant slopes have gradients of 5 to 30 percent. This LTA is variably dissected by streams, with the dominant stream pattern being dendritic across the glaciated slopes, to deranged in the glacial till deposits. Wetlands, seeps, and ponds are a major component of this LTA.

LTA Components: This landtype association consists of cirque basins and narrow trough bottoms, glaciated slopes, and moraine.

Cirque basins and narrow trough bottoms are formed in sandstone/shale bedrock and relatively thin glacial deposits. Slope gradients range from 5 to 40 percent. Soils on these landforms are very shallow to moderately deep, moderately developed, well drained gravelly sandy loams, loams, and silt loams in the upland positions, and somewhat poorly to poorly drained sandy loams, silt loams, and silty clay loams in depressions and bottoms. These soils are classified as Typic Cryochrepts, Alfic Cryochrepts, Oxyaquic Cryoborolls, and Typic Cryoboralfs. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is slender wheatgrass, tufted hairgrass, subalpine fir, and spruce series. This component represents 20 percent of this LTA.

Glaciated slopes occur on sandstone/shale residuum and relatively thin glacial till. Slope gradients range from 10 to 40 percent. Soils on these slopes are moderately deep, moderately developed sandy loams, loams, and clay loams. These soils are classified as Typic Cryochrepts, Typic Cryoborolls, and Typic Cryoboralfs. Rock outcrop occurs on about 5 percent of this landscape component. The dominant natural potential vegetation is subalpine fir, whitebark pine-subalpine fir, Douglas-fir, rough fescue and big sagebrush series. This landscape component represents about 60 percent of this LTA.

Glacial moraine is comprised of sandstone/shale till deposition. Slope gradients range from less than 2 to 35 percent. Soils on these landforms are moderately deep to deep, moderately developed, gravelly and stony sandy loams,

silt loams, and clay loams. These soils are classified as Typic Cryochrepts and Typic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir, and subalpine fir series. This landscape component represents about 20 percent of the LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA54-M332En

GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges and basins in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

54-M332En 678

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in gentle to moderately sloping glaciated mountains. It is composed of cirque basins, moraines and trough valley bottoms. Parent materials include rhyolitic ash-flow tuffs, welded tuffs and andesite porphyry and basalt.

Accessory Characteristics: Dominant soils are moderately deep to deep loams to clay loams. Numerous rock fragments are present with stone to boulder size glacial till on the surface. Soils with organic surfaces and organics occur in depressional areas under sedges and moist forbs. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). Elevation ranges from 2134 to 2561 meters (7000 to 8400 feet). Slopes range from 0 to 50 percent; dominant slopes are 10 to 30 percent. This unit is moderately to highly dissected by streams, with dominant stream patterns being dendritic.

LTA Components: This landtype association consists of cirque basins, moraines and trough valley bottoms.

Cirque basins are large hollows scooped out of the heads of valleys by glacial erosion. Soils are moderately deep to deep. Slopes range from 0 to 30 percent; with dominant slopes of 5 to 20 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoboralfs and Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 30 percent of this map unit.

Moraines are undulating areas formed by glacial drift. Soils are moderately deep to deep. Slopes range 0 to 50 percent; with dominant slopes 5 to 35 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoboralfs and Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 40 percent of this map unit.

Trough valley bottoms formed in glacial-fluvial sediments. Soils are deep. Slopes range 0 to 20 percent, with dominant slopes 5 to 15 percent. Dominant soils include Typic Cryoborolls, Typic Cryaquolls, and Fluvents under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryochrepts and Fluvents occur under Douglas-fir, subalpine fir and whitebark pine series. This component represents 20 percent of this map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA54-M332E
LTA54-M332D

GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Boulder Mountains on the Beaverhead-Deerlodge National Forest and the Helena National Forest. These occur in southwest Montana in the upper Jefferson River and upper Clark Fork River Basins.

Acreage by Section

54-M332E	30,482	(Section except for M332En)
54-M332D	45,449	

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a glaciated mountain landscape setting, which is typically composed of glaciated mountain slopes and moraines. Parent materials are glacial deposits and residuum underlain by volcanic bedrock.

Accessory Characteristics: The primary soils range from very deep to shallow to bedrock. They are loamy with high cobble contents especially in the subsurface layers. The vegetation is a mosaic of coniferous forest and wet meadows with the forest dominating. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1677 to 2591 meters (5500 to 8500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is highly dissected by streams, with the dominant stream patterns being parallel or dendritic on sideslopes with a deranged pattern locally in glacial moraines. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of moraines and glaciated mountain slopes.

Moraines are formed in volcanic glacial deposits. Volcanic ash affected loess deposits often influence surface soil characteristics. Slope gradients range from 0 to 35 percent. Soils on these landforms are very deep, moderately developed, with cobbly loam, very cobbly loam and clay loam surface textures. Very cobbly loams typify subsurface textures. These soils are classified as Typic and Aquic Cryochrepts and Cryoboralfs. Rock outcrop does not occur in this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. Meadows in this component have soils classified as Typic and Aquic Cryoborolls, and Typic Cryaquoll with willow, sedge, and tufted hairgrass. This component represents 70 percent of this LTA.

Glaciated mountain slopes are formed in volcanic bedrock. Volcanic ash affected loess deposits often influence surface soil characteristics. Slope gradients range from 20 to 50 percent. Soils on these landforms are typically shallow to moderately deep, weakly to moderately developed with cobbly loam or loam surface textures. The subsurface layers are very or extremely cobbly loams. These soils are classified as Typic and Lithic Cryochrepts and Typic Cryoboralfs. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, and subalpine fir-whitebark pine series. This component represents 30 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA57-M332Ek

GLACIATED MOUNTAIN SLOPES: GNEISSES & SCHISTS

Location: This LTA is located in the Tobacco Root mountains. It is drained by the Ruby and Madison Rivers in the Jefferson and Madison Basins.

Acreage by Subsection
57-M332Ek 25,943

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a gently to moderately sloping glaciated landscape setting, which is typically composed of cirque basins, trough bottoms, glaciated slopes, and moraine. Parent materials are undifferentiated glacial drift, colluvium, and residuum derived from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, metadiabase, sillimanite schist, quartz feldspar gneiss, metamorphosed granite and migmatite.

Accessory Characteristics: The primary soils are moderately deep, somewhat poorly drained loams and clay loams; and shallow to moderately deep, well drained, gravelly and cobbly sandy loams. The vegetation is a mosaic of coniferous forest, alpine and subalpine grassland, and mountain grassland. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is about 1981 to 2987 meters (6500 to 9800 feet). The dominant slope gradient are 5 to 30 percent. This LTA is variably dissected by streams, with the dominant stream pattern being dendritic across the glaciated slopes, to deranged in the glacial till deposits. Wetlands, seeps, and ponds are a significant component of this LTA.

LTA Components: This landtype association consists of cirque basins and narrow trough bottoms, glaciated slopes, and moraine.

Cirque basins and narrow trough bottoms are formed in gneiss/schist bedrock and relatively thin glacial deposits. Slope gradients range from 5 to 40 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately developed, well drained gravelly loamy sands, sandy loams, and loams in upland positions, and somewhat poorly to poorly drained sandy loams, and silt loams in depressions and bottoms. These soils are classified as Lithic and Typic Cryochrepts, and Aquic and Oxyaquic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, spruce, and sedge series. This component of the landscape represents about 20 percent of the LTA.

Glaciated slopes occur on gneiss/schist residuum and relatively thin glacial till. Slope gradients range from 10 to 40 percent. Soils on these slopes are moderately deep, weakly to moderately developed sandy loams, loams, and clay loams. These soils are classified as Typic Cryochrepts and Typic Cryumbrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant natural potential vegetation is Douglas-fir, subalpine fir, and whitebark pine-subalpine fir series. This landscape component represents about 60 percent of this LTA.

Glacial moraine is comprised of gneiss/schist till deposition. Slope gradients range from less than 2 to 35 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, gravelly and stony loamy sands, sandy loams, and loams. These soils are classified as Dystric and Typic Cryochrepts. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir and subalpine fir series. This landscape component represents about 20 percent of the LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA57-M332En

GLACIATED MOUNTAIN SLOPES: GNEISS

Location: This LTA is located throughout the Greenhorn and Gravelly mountain ranges and basins in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

57-M332En 6,983

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in gentle to moderately sloping glaciated mountains. It is composed of cirque basins, moraines and trough valley bottoms. Parent materials include Precambrian gneiss, schist, phyllites, amphibolites, metasedimentary rocks with minor amounts of gabbro sills and marble.

Accessory Characteristics: Dominant soils are moderately deep to deep sandy loams to loams. Numerous rock fragments are present with stone to boulder size glacial till on the surface. Soils with organic surfaces and organics throughout occur in depressional areas under sedges and moist forbs. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). Elevation ranges 2134 to 2439 meters (7000 to 8000 feet). Slopes range 0 to 50 percent; dominant slopes are 10 to 30 percent. This unit is moderately to highly dissected by streams, with dominant stream pattern being dendritic.

LTA Components: This landtype association consists of cirque basins, moraines and trough valley bottoms.

Cirque basins are large hollows scooped out of heads of valleys by glacial erosion. Soils are moderately deep to deep. Slopes range 0 to 30 percent with dominant slopes 5 to 20 percent. Dominant soils include Argic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryoborolls and Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Typic Cryumbrepts occur under whitebark pine series and alpine tundra. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 30 percent of this map unit.

Moraines are undulating areas formed by glacial drift. Soils are moderately deep to deep. Slopes range 0 to 50 percent with dominant slopes 5 to 35 percent. Dominant soils include Typic Cryoborolls and Pachic Cryoborolls under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryochrepts occur under Douglas-fir, subalpine fir and whitebark pine series. Stone to boulder size glacial till is on the surface. Rock outcrop occupies 10 to 30 percent of this component. This component represents 40 percent of this map unit.

Trough valley bottoms formed in glacial-fluvial sediments. Soils are deep. Slopes range 0 to 20 percent, with dominant slopes 5 to 15 percent. Dominant soils include Typic Cryoborolls, Typic Cryaquolls, and Fluvents under mountain big sagebrush, Idaho fescue and tufted hairgrass series. Histic Cryaquolls and Histosols occur under sedge, willow and moist forb series. Typic Cryochrepts and Fluvents occur under Douglas-fir, subalpine fir and white-bark pine series. This component represents 20 percent of this map unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA60-M332E

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This LTA is located in the Anaconda-Pintlar, Beaverhead Mountains, Pioneers, Fleciers, Highlands, and Lima Peaks of southwest Montana on the Beaverhead/Deerlodge National Forest. These mountains are drained by the Big Hole, Jefferson, Beaverhead, Red Rock, and Horse Prairie in the Jefferson Basin.

Acreage by Section

60-M332E	90,807

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting, below the elevational zone of strong and moderate frost shattering. This unit is typically composed of dissected slopes with ridges and narrow, mostly ephemeral, bottoms. Parent materials are colluvium and residuum composed of and underlain by metamorphosed sediments of Precambrian Y Belt Supergroup undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are moderately deep, well drained, dark colored sandy loams, loams, and clay loams. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 30 to 76 centimeters (12 to 30 inches). The elevation range of this LTA is 1981 to 2682 meters (6500 to 8800 feet). The dominant slopes have gradients of 20 to 40 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of slopes with rounded ridges and narrow, steep, mostly ephemeral valley bottoms.

Mountain slopes and ridges are formed in colluvium and residuum. Slope gradients range from 10 to 60 percent. Soils on these landforms are moderately deep, moderately well developed sandy loams, loams, and clay loams. These soils are classified as Typic Cryochrepts, Typic Cryoboralfs and Typic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, low sagebrush, Idaho fescue, Douglas-fir, and subalpine fir series. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA61-M332E
LTA61-M332D

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: This LTA is located in the Boulder, Elkhorn and Highland Mountains on the Beaverhead-Deerlodge National Forest and the Helena National Forest in southwest Montana. These occur in the upper Jefferson River, Prickly Pear Creek, 10 Mile Creek and Clark Fork River Basins.

Acreage by Section

61-M332E	308,903
61-M332D	251,536

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes, rolling uplands and alluvial flats. Parent materials are residuum underlain by weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with gravelly sandy and loamy textures. The vegetation is a mosaic of shrublands and grasslands and coniferous forest. Small areas of aspen are common. Mean annual precipitation ranges from 30 to 76 centimeters (12 to 30 inches). The elevation range of this LTA is 1373 to 2591 meters (4500 to 8500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately or highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a major component in this LTA on the Deerlodge National Forest.

LTA Components: This landtype association consists of stream dissected mountain slopes, rolling uplands, and alluvial flats.

Stream dissected mountain slopes are formed in weathered granitic bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, weakly and moderately developed, with gravelly sandy and loamy textures. These soils are classified as Typic and Lithic Cryoborolls, Cryochrepts, Cryoboralfs, and Cryorthents. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is sagebrush, Idaho fescue, Douglas-fir and subalpine fir series. This component represents 55 percent of this LTA.

Rolling uplands are formed in moderately and weakly weathered granitics granite-diorites and diorites. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep and deep, are weakly and moderately developed, and have sandy loam, gravelly sandy loam and loamy sand surface soils. The subsurface layers are gravelly sandy loams, gravelly loamy sands and loamy sands in the less developed soils and gravelly sandy clay loams and sandy clay loams where subsoil clay accumulation occurs. Ustochrepts, Eutrobioralfs and Haploborolls prevail at the lower elevations. Typic and Lithic Cryoboralfs and Cryoborolls dominate at the mid to high elevations. Rock outcrop occurs on about 5 percent of this landscape component. Boulders are scattered on the surface on parts of the unit. The dominant potential natural vegetation is Douglas-fir series. Cooler aspects at higher elevations are dominated by Douglas-fir and subalpine fir series. The grasslands and shrublands are dominated by mountain big sagebrush and rough fescue series. Spruce series dominates the wet forest inclusions. This component represents 35 percent of this LTA.

Alluvial flats are formed in weathered granitic bedrock. Slope gradients range

from 0 to 15 percent. Soils on these landforms are deep, weakly developed, with gravelly loamy textures. These soils are classified as Oxyaquic and Typic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 10 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA62-M332E
LTA62-M332D

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This LTA is located in the Ten Mile Creek basin, the Elkhorn Mountains, the Big Belt Mountains, and the Continental Divide Uplands.

Acreage by Subsection

62-M332E	949
62-M332D	88,948

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are residuum and colluvium underlain by granite, granitic diorite and diorite.

Accessory Characteristics: The primary soils have medium or moderately coarse textured surfaces and moderately coarse and coarse textured subsurface layers. The vegetation is a mosaic of coniferous forest and forested scree. Mean annual precipitation ranges from 50 to 75 centimeters (20 to 30 inches). The elevation range of this LTA is 1554 to 2438 meters (5100 to 8000 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is mostly undissected.

LTA Components: This landtype association consists of mountain slopes and ridges.

Mountain slopes and ridges are formed in weakly weathered granites, granite-diorites, and diorites. Higher elevations can have volcanic ash influenced surface soil. Slope gradients range from 10 to 60 percent. Soils on these landforms are extremely variable in terms of depth to bedrock, display little to no soil development and have cobbly loam, extremely cobbly sandy loam and extremely bouldery sand surface soils. Subsurface soils vary also and include extremely cobbly sandy loam, very cobbly sandy loam and extremely bouldery sand textures. These soils are mostly classified as Typic Cryochrepts and Typic Cryorthents. Boulders are scattered about the surface in portions of the unit. Rock outcrop and scree occurs on about 45 percent of this landscape component. The dominant potential natural vegetation is subalpine fir-whitebark pine series at the higher elevations with subalpine fir and Douglas-fir series on the lower slopes. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA63-M332En

MOUNTAIN SLOPES AND RIDGES: GNEISS

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

63-M332En 37,136

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of gentle to moderate slopes. Parent materials are colluvium and residuum derived from Precambrian gneiss, schists, phyllites, metasedimentary rocks and minor components of gabbro sills and marble.

Accessory Characteristics: Dominant soils are deep to very deep sandy loams to loams with numerous rock fragments. The vegetation varies from mountain shrublands and grasslands to conifers. Mean annual precipitation ranges from 40 to 102 centimeters (16 to 40 inches). The elevation range is from 1951 to 2866 meters (6400 to 9400 feet). The slope range is from 0 to 50 percent with dominant slope gradients of 10 to 40 percent. This unit is slightly to moderately dissected by streams, with dominant stream patterns being dendritic to subparallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in both colluvium and residuum. Slope gradients range from 0 to 50 percent, with 10 to 40 percent being dominant. Soils are deep to very deep and well developed. Dominant soils include Typic Cryoborolls under mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, subalpine for meadows and lower elevation Douglas-fir series. Under higher elevation Douglas-fir, subalpine fir and whitebark series the dominant soils include Typic Cryochrepts.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA63-M332E
LTA63-M331A

MOUNTAIN SLOPES AND RIDGES: GNEISSES AND SCHISTS

Location: This LTA is located in the Tendoy, Tobacco Roots and Madison Ranges in southwest Montana. Major drainages are the Red Rock, Beaverhead, Ruby and Madison Rivers in the Jefferson Basin and Madison Basins.

Acreage by Section

63-M332E	73,719	(Section except for M332En)
63-M331A	179,717	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting, below the elevational zone of strong and moderate frost shattering. This unit is typically composed of dissected slopes with ridges and narrow, mostly ephemeral, bottoms. Parent materials are colluvium and residuum derived from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diabase, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite, and migmatite, including the Dillon Granite-Gneiss in the Tendoy Mountains.

Accessory Characteristics: The primary soils are moderately deep, well drained, dark colored, channery loams and fine sandy loams. The vegetation is a mosaic of coniferous forest and mountain grassland. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 2042 to 2652 meters (6700 to 8700 feet). The dominant slopes have gradients of 25 to 50 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of slopes with rounded ridges and narrow, steep, mostly ephemeral valley bottoms.

Mountain slopes and ridges are formed in colluvium and residuum. Slope gradients range from 25 to 50 percent. Soils on these landforms are moderately deep, weakly to moderately developed, channery loams and fine sandy loams. These soils are classified as Typic Cryochrepts and Typic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Douglas-fir and subalpine fir series. This landscape component represents about 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA64-M332E
LTA64-M332D
LTA64-M331A

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located in the Boulder, Elkhorn, Fleecer, Anaconda, Pintlar, Beaverhead, Madison, Pioneer, Lima Peaks, Tendoy, and Gallatin Mountains on the Beaverhead-Deerlodge, Helena, and Gallatin National Forests. These occur in southwest Montana in the upper Missouri River Basin and the upper Little Blackfoot drainage.

Acreage by Section

64-M332E	216,232
64-M332D	197,349
64-M331A	21,460

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes and mountain ridges. Parent materials are residuum underlain by Tertiary and Cretaceous volcanic bedrock, including andesite, dacite, rhyolite, welded and non-welded rhyolite and felsic tuffs, and locally basalt and minor metagabbro dikes.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep loamy soils often with high cobble contents. The vegetation is a mosaic of coniferous forest and shrubland/grassland, coniferous forest or shrubland/grassland. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1525 to 2378 meters (5000 to 7800 feet). The dominant slopes have gradients of 5 to 60 percent. The mountain slopes component of this LTA is moderately dissected by streams with the dominant stream patterns being parallel or dendritic. The mountain ridges are generally undissected. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes and mountain ridges.

Stream dissected mountain slopes are formed in colluvium and residuum over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Slope gradients range from 25 to 60 percent. Soils on these landforms are shallow, moderately deep and deep to bedrock. They are moderately and weakly developed with cobbly and very cobbly loam surface textures. The subsurface layers are very cobbly and extremely cobbly loams. These soils are classified as Typic and Lithic Cryochrepts and Cryoborolls, and Typic and Mollic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 50 percent of this LTA.

Mountain ridges are formed in residuum and colluvium over a variety of volcanic bedrock. Some high elevation areas are influenced by volcanic ash loess deposits. Included in this component is rolling uplands found in the eastern portion of the Elkhorns. Slope gradients range from 10 to 40 percent.

Soils on these landforms are mostly moderately deep and shallow to bedrock. They are moderately and weakly developed with cobbly, stony and very cobbly loam or loam surface textures. The subsurface layers are very cobbly, very stony, extremely cobbly and extremely stony loams and clay loams. These soils

are mostly classified as Typic and Lithic Cryochrepts on forested sites and Argic and Lithic Cryoborolls on grassland/shrublands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is rough fescue, big sagebrush, Douglasfir, and subalpine fir series. This component represents 50 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest; Larry Laing, Helena National Forest

LTA65-M332En

MOUNTAIN SLOPES AND RIDGES: SOFT SEDIMENTARY ROCKS

Location: This LTA is located throughout the Gravelly mountains in southwest Montana which is drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

65-M332En	15,877

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit exists adjacent and on top of the Gravelly mountain range. The soils are formed in residuum derived from Mesozoic and Paleozoic shales and interbedded sandstones. There are minor amounts of limestone.

Accessory Characteristics: Dominant soils are deep to very deep fine loams to clays. The vegetation varies from shrublands, grasslands, and subalpine meadows to conifers. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). The elevation range is from 2621 to 2927 meters (8600 to 9600 feet). The slope range is 0 to 30 percent, with dominant slopes 5 to 20 percent. This unit is slightly to moderately dissected by streams, with a dendritic stream pattern.

LTA Components: This landtype association consists of gentle mountain slopes.

Gentle mountain slopes occur adjacent and on top of the mountain range. Soils are formed in residuum derived from soft sedimentary shales and interbedded sandstones, with minor components of limestone. Slopes range from 0 to 30 percent, with dominant slopes 5 to 20 percent. Dominant soils include Pachic Cryoborolls and Argic Cryoborolls under mountain big sagebrush, Idaho fescue, tufted hairgrass series and subalpine forbs. Minor amounts of Argiaquic Cryoborolls and Histosols occur under carex series. Typic Cryoborolls occur under subalpine fir series and whitebark pine series. Mottles can be present in the soil profile indicative of high water tables.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA65-M332E
LTA65-M332D

MOUNTAIN SLOPES AND RIDGES: SOFT SEDIMENTARY ROCKS

Location: This LTA is located in nearly all the mountain ranges on the Lewis and Clark (Rocky Mountain Front, Big & Little Snowies, Crazies, Castles, and Little Belt mountains), as well as in the Fleecer and Bull Mountains in southwest Montana on the Beaverhead-Deerlodge Forest.

Acreage by Section

65-M332E	17,413
65-M332D	42,266

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on benches, basins, ridges, and valley sideslopes. Parent materials are soft sandstones and shales.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep, skeletal loams and sandy loams. The vegetation is coniferous forest and fescue grassland. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 1500 to 2439 meters (5000 to 8000 feet). The dominant slopes have gradients of 10 to 60 percent. This LTA is moderately dissected with the dominant stream pattern being dendritic. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of benches and lower valley slopes, steep valley sideslopes, and ridges and upland flats and basins.

Benches and lower valley slopes are formed in shale, sandstone, and alluvium. These landforms have slope gradients that range from 0 to 25 percent. Soils on these landforms are moderately deep and deep, well developed, and consist mainly of clay loam and clay. The major soils are classified as Typic and Vertic Cryoborolls. Rock outcrop occurs on 5 percent of this landscape component. The dominant potential natural vegetation is rough fescue and Douglas-fir series. This component represents 30 percent of this LTA.

Steep valley sideslopes are formed in shale and sandstone. These landforms have slope gradients that range from 25 to 60 percent. Soils on these landforms are moderately deep, weakly developed, and consist mainly of very gravelly and cobbly loams and sandy loams. The major soils are classified as Typic Cryoborolls and Cryoboralfs. Rock outcrop makes up less than 15 percent of this component. The dominant potential natural vegetation is rough fescue, subalpine fir, Douglas-fir and limber pine series. This component represents 35 percent of this LTA.

Ridges and upper slopes and basins are formed in sandstone and shale. These landforms have slope gradients that range from 10 to 40 percent. Soils on these landforms are extremely cobbly loams and sandy loams. The major soils are classified as Typic and Andic Cryoborolls and Cryochrepts. Rock outcrop makes up less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir and rough fescue series. This component represents 20 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA66-M332Ea
LTA66-M332Dm

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located in the Elkhorn and Highland Mountains on the Beaverhead-Deerlodge National Forest. These are in the Jefferson River Basin in southwest Montana.

Acreage by Subsection

66-M332Ea	4,501
66-M332Dm	19,493

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are residuum underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with cobbly loamy textures. The vegetation is a mosaic of coniferous forest and shrublands and grasslands. Mean annual precipitation ranges from 36 to 51 centimeters (14 to 20 inches). The elevation range of this LTA is 1677 to 2287 meters (5500 to 7500 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in limestone bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are shallow and moderately deep, moderately developed, and have cobbly loamy textures. These soils are classified as Typic and Lithic Cryochrepts and Cryoboralfs; and Argic and Lithic Cryoborolls. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA66-M332En

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

66-M332En 34,857

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of gentle to moderate slopes. Parent materials are colluvium and residuum derived from Cretaceous, Triassic and Paleozoic limestones with minor amounts of interbedded calcareous shales, Archean marbles, dolomites and associated cherts.

Accessory Characteristics: Dominant soils are deep to very deep loams to clay loams with numerous rock fragments. The vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 40 to 76 centimeters (16 to 30 inches). Elevation ranges from 1951 to 2866 meters (6400 to 9400 feet). Slopes range from 0 to 50 percent with dominant slope gradients 10 to 40 percent. This unit is slightly to moderately dissected by streams, with dominant stream patterns being dendritic to subparallel.

LTA Components: This landtype association consist of mountain slopes.

Mountain slopes formed in colluvium and residuum. Slopes range from 0 to 50 percent, with 10 to 40 percent being dominant. Soils are deep to very deep and well developed. Dominant soils include Calcic Cryoborolls under mountain big sagebrush, Idaho fescue, bluebunch wheatgrass and lower elevation Douglasfir series. Under higher elevation Douglas-fir, subalpine fir and whitebark pine series the dominant soils include Typic Cryochrepts. Argic Cryoborolls and Pachic Cryoborolls occur under tufted hairgrass series and forb subalpine meadows.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA68-M332En

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location This LTA is located throughout the Snowcrests and Gravelly Mountain Ranges in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

68-M332En	56,509

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated gentle to moderate slopes. Parent material is colluvium and residuum derived from Mesozoic shales and siltstones with minor amounts of interbedded sandstone, Proterozoic shale and inclusions of quartzite and chert.

Accessory Characteristics: Dominant soils are deep to very deep loamy to fine soils with minimal rock fragments. The vegetation varies from mountain shrublands and grasslands to conifers. Mean annual precipitation ranges from 40 to 76 centimeters (16 to 30 inches). The elevation range is from 1890 to 2927 meters (6200 to 9600 feet). Slopes range from 0 to 50 percent, with dominant slope gradients 10 to 40 percent. This unit is slightly to moderately dissected by streams, with dominant stream patterns being dendritic.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in both colluvium and residuum. Slope gradients range from 0 to 50 percent, with dominant slope gradients 10 to 40 percent. Soils are deep to very deep and well developed. Dominant soils include Argic Cryoborolls, Typic Cryoborolls and Calcic Cryoborolls under mountain big sagebrush, Idaho fescue, bluebunch wheatgrass, tufted hairgrass, limber pine and Douglas-fir series. Dominant soils are Typic Cryochrepts under subalpine fir and whitebark pine series.

Compiled by: Annie Greene Beaverhead-DeerLodge National Forest

LTA68-M332E
LTA68-M331A

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Lima Peaks (portion of Beaverhead Range), Tendoy, Pioneers, Fleecer, Tobacco Roots, and Madison Range in southwest Montana. They occur on the Beaverhead-Deerlodge National Forest in the Jefferson and Madison River Basins.

Acreage by Section

68-M332E	205,962	(Section except for M332En)
68-M331A	152,581	

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting below the elevational zone of strong and moderate frost shattering. This unit is typically composed of dissected slopes with ridges and narrow, mostly ephemeral, bottoms. Parent materials are Tertiary to Cambrian sediments undifferentiated, consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rock occurs.

Accessory Characteristics: The primary soils are moderately deep, loams, clay loams and silty clays. The vegetation is a mosaic of mountain grasslands and coniferous forests. Mean annual precipitation ranges from 41 to 91 centimeters (16 to 36 inches). The elevation range of this LTA is 1829 to 2682 meters (6000 to 8800 feet). The dominant slopes have gradients of 15 to 50 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being parallel, but deranged in secondary mass wasting areas. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of slopes with rounded ridges and narrow, steep, mostly ephemeral valley bottoms.

Mountain slopes and ridges are formed in colluvium-alluvium and residuum of shale and sandstone parent materials. Slope gradients range from 15 to 50 percent. Soils on these landforms are moderately deep, moderately to highly developed, dark colored, clay loams, silty clays, and sandy loams and loams. These soils are classified as Argic Pachic Cryoborolls, Typic Cryoborolls, and Mollic and Typic Cryoboralfs. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Idaho fescue, tufted hairgrass, and Douglasfir series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA69-M332E
LTA69-M331A

PEDIMENTS: MIXED GEOLOGY

Location: This LTA is located in the Lima Peaks (Beaverhead Mountains), Tendoy, and southern Madison Range in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

69-M332E	2,408
69-M331A	412

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in an unglaciated, mountain slope landscape setting below the elevational zone of strong and moderate frost shattering. This unit is typically comprised of relatively undissected sloping and gently sloping straight to slightly concave slopes, often with a thin veneer of colluvium. Parent materials are mixed sedimentary, predominantly Cretaceous sediments consisting of shale, siltstone, sandstone, and subordinate conglomerate, limestone, and carbonaceous material, and including minor volcanic rock. The colluvial veneer is apparently Quaternary aged deposits.

Accessory Characteristics: The primary soils are shallow, well drained, gravelly loams. The vegetation is a mosaic of mountain grassland and coniferous forest. Mean annual precipitation ranges from 36 to 61 centimeters (14 to 24 inches). The elevation range of this LTA is 2042 to 2347 meters (6700 to 7700 feet). The dominant slopes have gradients of less than 20 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being parallel. Wetlands, lakes, and ponds are absent in this LTA.

LTA Components: This landtype association consists of relatively long, smooth, straight to slightly concave slopes.

Pediment slopes are formed in residuum of shale, sandstone, and limestone parent material. Slope gradients range from less than 10 to 20 percent. Soils on these landforms are shallow, moderately developed, gravelly loams. These soils are classified as Lithic Calciborolls and Typic Calciborolls. Rock outcrop typically does not occur on this landscape component. The dominant potential natural vegetation is big sagebrush series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA70-M332E
LTA70-M332D

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This LTA is located in the Fleece, Highlands, Anaconda-Pintlar, Pioneer, Beaverhead, Tendoy, and Lima Peaks (Beaverhead Mountains) ranges. These occur in southwest Montana on the Beaverhead/Deerlodge National Forest in the Jefferson and Madison River Basins.

Acreage by Section

70-M332E	132,440
70-M332D	419

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping, mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from metamorphosed sediments of the Precambrian Y Belt Supergroup, undifferentiated, consisting of fine to coarse grained quartzite, siltite, argillite, carbonate, and sandstone.

Accessory Characteristics: The primary soils are very shallow to moderately deep, channery and flaggy sandy loams and loams. The vegetation is a mosaic of alpine turf, subalpine grasslands, subalpine forest, montane coniferous forest, and mountain grassland. Mean annual precipitation ranges from 36 to 127 centimeters (14 to 50 inches). The elevation range of this LTA is 2134 to 3353 meters (7000 to 11000 feet). The dominant slopes have gradients of 25 to 50 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes and ponds are a minor component of this unit. Some glaciated areas are included in this unit, but frost shattering has become a dominant landform process since glaciation.

LTA Components: This landtype association consists of frost shattered slopes and ridges.

Frost shattered slopes and ridges are formed in colluvium and residuum derived from metasediment rocks comprised mostly of quartzite, siltite, and argillite. Slope gradients range from 5 to 70 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately developed, stony loamy sands, sandy loams, and loams. These soils are classified as Typic and Alfic Cryorthents, and Alfic, Dystric, and Typic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. In the Highland Mountains, up to 50 percent of the unit is scree. The dominant potential natural vegetation is sedge, Idaho fescue, subalpine fir, whitebark pine subalpine fir, and big sagebrush series. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA71-M332E

FROST SHATTERED MOUNTAIN RIDGE TOPS: HIGHLY WEATHERED GRANITICS

Location: This LTA is located in the Lima Peaks, Beaverhead (including Anaconda-Pintlar), Pioneers, Fleciers, and Tobacco Root Mountains in southwest Montana in the Jefferson and Madison River Basins.

Acreage by Section

71-M332E	82,959

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from granite, quartz, monzonite, and granodiorite.

Accessory Characteristics: The primary soils are very shallow to moderately deep, gravelly and stony loamy sands, sandy loams, and loams. The vegetation is a mosaic of talus, alpine turf, alpine, subalpine and montane coniferous forest, and some mountain grasslands. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 2134 to 3048 meters (7000 to 10000 feet). The dominant slopes have gradients of 20 to 40 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered slopes and ridges.

Frost shattered slopes and ridges are formed in colluvium and residuum derived from granitic rocks. Slope gradients range from 5 to 50 percent. Soils on these landforms are very shallow to moderately deep, weakly developed, excessively to well drained, gravelly and channery loamy sands, sandy loams and loams. These soils are classified as Lithic Cryorthents, Typic Cryorthents, Lithic Cryochrepts, and Typic Cryochrepts. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is white dryad, sedge, whitebark pine subalpine fir, subalpine fir series. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA72-M332E
LTA72-M332D
LTA72-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Gallatin, Madison, Absaroka-Beartooth mountain ranges in southwestern Montana. Included are the Crazy Mountains, Bridger Mountains, Anaconda Mountains and Continental Divide uplands.

Acreage by Section/Subsection:

72-M332E	838
72-M331A	25,079
72-M332Dc	1,571
72-M332Dp	106

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit consists of rounded ridgetops with weak stream dissection. Soil parent material is frost shattered glacial till and colluvium derived from hard crystalline rocks such as granite.

Accessory Characteristics: Vegetation is alpine turf or sparse to dense upper subalpine and lower subalpine forest. Elevation ranges from 1981 to 2987 meters (6500 to 9800 feet). Mean annual precipitation is greater than 125 centimeters (50 inches). Slope ranges from 0 to 20 percent.

LTA Components: This landtype association has two components:

Soils on rounded ridgetops in forest are Typic and Dystric Cryochrepts. They are deep, moderately coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up five percent of this component. The dominant potential natural vegetation is the subalpine fir, and subalpine fir-whitebark pine series. This component makes up 70 percent of this LTA.

Soils on rounded ridgetops with alpine turf are Dystric Cryochrepts. They are moderately deep, coarse textured, rocky, and have low fertility and water holding capacity. Rock outcrop makes up 20 percent of this component. A common potential natural vegetation series is Idaho fescue. This component makes up 30 percent of this LTA.

Compiled by: Henry Shovic, Gallatin National Forest

LTA73-M332En

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

73-M332En 1,723

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of mountain ridge tops. Parent materials are residuum derived from rhyolitic ash-flows tuffs, welded tuffs, andesitic porphyry and basalt.

Accessory Characteristics: Dominant soils are shallow to moderately deep loams to clay loams with numerous rock fragments. The vegetation varies from subalpine meadows, conifers to alpine tundra. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range is from 2134 to 2561 meters (7000 to 8400 feet). The slope range is from 0 to 20 percent with dominant slope gradients of 5 to 15 percent. This unit is slightly dissected by streams, with dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain ridge tops.

Mountain ridge tops are formed in residuum. Slope gradients range from 0 to 20 percent, with dominant slopes of 5 to 15 percent. Soils are shallow to moderately deep. Dominant soils include Typic Cryoborolls and Typic Cryochrepts under tufted hairgrass series, subalpine forbs, alpine tundra and whitebark pine series. Rock outcrop occurs on 5 to 20 percent of this unit.

Compiled by: Annie Greene. Beaverhead-Deerlodge National Forest

LTA73-M332E
LTA73-M332D

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This LTA is located in the Fleece, Boulder, Elkhorn, and Anaconda-Pintlar (Beaverhead Mountains) Ranges on the Beaverhead/Deerlodge National Forest. These occur in southwest Montana in the Jefferson and Madison River Basins.

Acreage by Section

73-M332E	12,383	(Section except for M332En)
73-M332D	23,449	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from mostly Tertiary volcanic rocks and volcaniclastic rocks, including andesite, dacite, and rhyolite, welded and non-welded tuffs, and locally minor metagabbro dikes.

Accessory Characteristics: The primary soils are shallow to moderately deep, channery loams and sandy loams. The vegetation is mostly subalpine coniferous forest. Mean annual precipitation ranges from 41 to 76 centimeters (16 to 30 inches). The elevation range of this LTA is 2134 to 2896 meters (7000 to 9500 feet). The dominant slopes have gradients of 5 to 20 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being dendritic, or is undissected. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered slopes and ridges.

Frost shattered slopes and ridges are formed in colluvium and residuum derived from volcanic rocks comprised mostly of rhyolite, welded tuffs, and andesite. Slope gradients range from 5 to 50 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, well drained channery loams and sandy loams and extremely cobbly loams. These soils are classified as Lithic and Typic Cryoboralfs, Lithic and Typic Cryochrepts, and Typic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. On the Helena NF, up to 25 percent of the unit is scree. The dominant potential natural vegetation is whitebark pinesubalpine fir, subalpine fir, rough fescue, and Idaho fescue series. This component represents 100 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA74-M332En

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES AND SHALES

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

74-M332En	464

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of mountain ridge tops. Parent materials are residuum derived from Mesozoic shales and siltstones with minor amounts of interbedded sandstones.

Accessory Characteristics: Dominant soils are shallow to moderately deep loams to clay loams with numerous rock fragments. The vegetation varies from subalpine meadows, alpine tundra to conifers. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). The elevation range is from 2561 to 2866 meters (8400 to 9400 feet). The slope range is from 0 to 20 percent with dominant slope gradients of 5 to 15 percent. This unit is slightly dissected by streams, with dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain ridge tops.

Mountain ridge tops are formed in residuum. Slope gradients range from 0 to 20 percent, with dominant slopes of 5 to 15 percent. Soils are shallow to moderately deep. Dominant soils include Typic Cryoborolls and Typic Cryochrepts under tufted hairgrass series, subalpine forbs, alpine tundra and whitebark pine series. Rock outcrop occurs on 5 to 20 percent of this unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA74-M332E
LTA74-M332D
LTA74-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES AND SHALES

Location: This LTA is located in the Pioneers, Fleciers, Beaverhead Mountains, Tendoy, Tobacco Root, and Madison Ranges in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

74-M332E	70,884	(Section except for M332En)
74-M332D	859	
74-M331A	10,729	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation, gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from Tertiary sediments consisting of shale, siltstone, sandstone, limestone, and calcareous clays. Minor gypsum, chert, and volcanic rocks occur.

Accessory Characteristics: The primary soils are very shallow to moderately deep silt loams, loams and clay loams. The vegetation is a mosaic of alpine turf, alpine and subalpine coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 41 to 127 centimeters (16 to 50 inches). The elevation range of this LTA is 2286 to 3048 meters (7500 to 10000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in colluvium and residuum derived from sandstones and shales. Slope gradients range from 10 to 50 percent. Soils on these landforms are very shallow to moderately deep, weakly to moderately well developed, silt loams, loams, and clay loams. The surface soils can be highly organic above 9000 feet (2743 meters). These soils are classified as Lithic Cryoborolls and Typic Cryoborolls, Typic Cryochrepts, and Mollic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sedge, parry's rush, whitebark pine-subalpine fir, and Douglas-fir series. This component represents 95 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA75-M332En

FROST SHATTERED MOUNTAIN RIDGE TOPS: QUARTZITES

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

75-M332En	3,523

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in nonglaciaded mountain slopes and is composed of mountain ridge tops. Parent materials are residuum derived from non-belt Paleozoic quartzites with minor amounts of sandstone and associated cherts.

Accessory Characteristics: Dominant soils are shallow to moderately deep course sandy loams to loams with numerous rock fragments. The vegetation varies from subalpine meadows and conifers to alpine tundra. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). Elevation ranges from 2561 to 2866 meters (8400 to 9400 feet). The slope range is from 0 to 20 percent with dominant slopes 5 to 15 percent. This unit is slightly dissected by streams, with dominant stream pattern being dendritic.

LTA components: This landtype association consists of mountain ridge tops.

Mountain ridge tops are formed in residuum. Slope gradients range from 0 to 20 percent, with dominant slopes 5 to 15 percent. Soils are shallow to moderately deep. Dominant soils include Typic Cryumbrepts and Typic Cryochrepts under tufted hairgrass series, subalpine forbs, alpine tundra and whitebark pine series. Rock outcrop occurs on 5 to 20 percent of this unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA77-M332En

FROST SHATTERED MOUNTAIN RIDGE TOPS: GNEISS

Location: This LTA is located throughout the Snowcrest, Gravelly, and Greenhorn mountains in southwest Montana. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

77-M332En	222

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of mountain ridge tops. Parent materials are residuum derived from Precambrian gneiss, schists, phyllites, amphibolites, metasedimentary rocks and minor amounts of gabbro sills and marbles.

Accessory Characteristics: Dominant soils are shallow to moderately deep course sandy loams to loams with numerous rock fragments. The vegetation varies from subalpine meadows and conifers to alpine tundra. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). The elevation range is 2561 to 2866 meters (8400 to 9400 feet). The slope range is from 0 to 20 percent with dominant slopes of 5 to 15 percent. This unit is slightly dissected by streams, with dominant stream pattern being dendritic.

LTA components: This landtype association consists of mountain ridge tops.

Mountain ridge tops are formed in residuum. Slope gradients range from 0 to 20 percent, with dominant slopes of 5 to 15 percent. Soils are shallow to moderately deep. Dominant soils include Typic Cryumbrepts and Typic Cryochrepts under tufted hairgrass series, subalpine forbs, alpine tundra and whitebark pine series. Rock outcrop occurs on 5 to 20 percent of this unit.

Compiled by: Annie Greene, Beaverhead-Deerlodge National Forest

LTA77-M332E
LTA77-M331A

FROST SHATTERED MOUNTAIN RIDGE TOPS: GNEISSES AND SCHISTS

Location: This LTA is located the Tobacco Root and Madison Ranges in southwest Montana in the Jefferson and Madison Basins.

Acreage by Section

77-M332E	18,445	(Section except for M332En)
77-M331A	62,911	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a relatively high elevation gently to moderately sloping mountain landscape setting, at or above the zone of moderate and strong frost shattering. The unit is typically composed of frost shattered ridges and slopes, ranging from patterned ground to soil heaving. Parent materials are colluvium and residuum from Pre-Belt crystalline metamorphic rocks consisting of hornblende gneiss, quartzite, meta-diorite, sillimanite schist, quartz-feldspar gneiss, metamorphosed granite, and migmatite.

Accessory Characteristics: The primary soils are shallow to moderately deep, channery loams and sandy loams. The vegetation is a mosaic of alpine turf, talus, subalpine and montane coniferous forest, and mountain grasslands. Mean annual precipitation ranges from 41 to 91 centimeters (16 to 36 inches). The elevation range of this LTA is 2134 to 2743 meters (7000 to 9000 feet). The dominant slopes have gradients of 20 to 40 percent. This LTA is weakly dissected by streams, with the dominant stream pattern being dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of frost shattered ridges and slopes.

Frost shattered ridges and slopes are formed in colluvium and residuum derived from gneisses and schists. Slope gradients range from 15 to 40 percent. Soils on these landforms are moderately deep, well drained, weakly to moderately developed, channery sandy loams. These soils are classified as Lithic and Typic Cryoborolls, and Lithic and Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is sedge, whitebark pine-subalpine fir, Douglas-fir, and subalpine fir series. This component represents 98 percent of this LTA.

Compiled by: Dan Svoboda, Beaverhead-Deerlodge National Forest

LTA81-M332E
LTA81-M332D

ROLLING HILLS: WEATHERED GRANITICS

Location: This LTA is located in the Boulder and Highland Mountains on the Beaverhead-Deerlodge National Forest in southwest Montana. It occurs in the upper Jefferson River and Clark Fork River Basins.

Acreage by Section:

81-M332E	36,161
81-M332D	95,357

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of rolling uplands. Parent materials are residuum and colluvium underlain by weathered granitic bedrock.

Accessory Characteristics: The primary soils are shallow to deep with gravelly sandy and loamy textures. The vegetation is coniferous forest and a mosaic of shrublands and grasslands and coniferous forest. Small areas of aspen are common. Mean annual precipitation ranges from 30 to 76 cms.(12 to 30 inches). The elevation range of this LTA is 1373 to 2591 meters (4500 to 8500 feet). The dominant slopes have gradients of 5 to 30 percent. This LTA is moderately or highly dissected by streams, with the dominant stream pattern being parallel and dendritic. Wetlands are a major component in this LTA.

LTA Components: This landtype association consists of two landform components: rolling uplands and alluvial flats.

Rolling uplands are formed in weathered quartz monzonite and similar coarse-grained igneous rocks of the Boulder Batholith. Slope gradients range from 0 to 40 percent. Soils on these landforms are shallow, moderately deep, to deep, are weakly to moderately developed, and have sandy loam, gravelly sandy loam and loamy sand surface soils. The subsurface layers are gravelly sandy loams, gravelly loamy sands and loamy sands in the less developed soils and gravelly sandy clay loams and sandy clay loams where subsoil clay accumulation occurs. Ustochrepts, Eutroboralfs and Haploborolls prevail at the lower elevations. Typic and Lithic Cryochrepts, Cryoboralfs and Cryoborolls dominate at the mid to high elevations. Rock outcrop occurs on 5 to 15 percent of this landscape component. Boulders are scattered on the surface on parts of the unit. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 80 percent of this LTA.

Alluvial flats are formed in granitic alluvium and weathered granitic bedrock. Slope gradients range from 0 to 15 percent. Soils on these landforms are deep, weakly developed, with gravelly loamy textures. These soils are classified as Oxyaquic and Typic Cryochrepts and Cryoborolls. Rock outcrop does not occur on this landscape component. The dominant potential natural vegetation is willow, sedge, spruce, and subalpine fir series. This component represents 20 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest.

LTA82-M332E
LTA82-M332D

ROLLING HILLS: VOLCANICS

Location: This LTA is located in the Boulder Mountains on the Beaverhead-Deerlodge Forest in southwest Montana. It occurs in the upper Clark Fork River basin.

Acreage by Section

82-M332E	6,817
82-M332D	13,249

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of rolling hills. Parent materials are residuum underlain by Tertiary and Cretaceous volcanic bedrock, including andesite, rhyolite, and welded and non-welded rhyolite and felsic tuffs.

Accessory Characteristics: The primary soils are shallow, moderately deep and deep loamy soils often with high cobble contents. The vegetation is coniferous forest or a mosaic of coniferous forest and shrubland/grassland. Mean annual precipitation ranges from 38 to 75 cms. (15 to 30 inches). The elevation range of this LTA is 1525 to 2135 meters (5000 to 7000 feet). The dominant slopes have gradients of 5 to 30 percent. This LTA is slightly to moderately dissected by streams with the dominant stream patterns being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of one landform component: rolling hills.

Rolling hills are formed in colluvium and residuum over a variety of volcanic bedrock. Slope gradients range from 5 to 30 percent. Soils on these landforms are shallow, moderately deep and deep to bedrock. They are moderately and weakly developed with cobbly and very cobbly loam surface textures. The subsurface layers are cobbly and very cobbly loams and clay loams. These soils are classified as Typic and Lithic Cryochrepts and Cryoborolls, and Typic and Mollic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Idaho fescue, sagebrush, Douglas-fir, and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest.

LTA83-M332En

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This LTA is located throughout the Snowcrest and Gravelly mountain ranges and basins. These are drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

83-M332En	33,829

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountain slopes and is composed of gentle to moderate slopes. Parent material consists of poorly consolidated fluvial and lacustrine Tertiary sediments.

Accessory Characteristics: Dominant soils are deep to very deep, coarse to fine loams. Textures are variable depending on parent material source. Rock fragments are lacking. The vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation is from 51 to 76 centimeters (20 to 30 inches). Elevation range is from 1951 to 2561 meters (6400 to 8400 feet). Slopes range from 5 to 50 percent with dominant slopes of 5 to 40 percent.

This unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic to subparallel.

LTA components: This landtype association consists of mountain slopes.

Mountain slopes formed in residuum and colluvium derived from poorly consolidated fluvial and lacustrine Tertiary sediments. Slopes range 5 to 50 percent, with dominant slopes of 5 to 40 percent. Dominant soils include Typic Cryoborolls and Argic Cryoborolls under mountain big sagebrush, Idaho fescue and Douglas-fir series. Under subalpine fir series there are Typic Cryochrepts.

Compiled by: Annie Greene, Beaverhead-DeerLodge National Forest

LTA83-M332E

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This LTA is located on foothills in the basin southwest of Butte and in the Deer Lodge Valley on the Beaverhead-Deerlodge National Forest. It occurs in southwest Montana in the upper Jefferson and Clark Fork River Basins.

Acreage by Section

83-M332E 118,120 (Section except for M332En)

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a foothill landscape setting, which is typically composed of old terraces. Parent materials are residuum underlain by Tertiary sedimentary rocks.

Accessory Characteristics: The primary soils are moderately deep with loamy and clayey textures. The vegetation is a mosaic of shrublands and grasslands. Mean annual precipitation ranges from 41 to 46 centimeters (16 to 18 inches). The elevation range of this LTA is 1768 to 1829 meters (5800 to 6000 feet). The dominant slopes have gradients of 0 to 35 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of old terraces.

Old terraces are formed in Tertiary sedimentary rocks. Slope gradients range from 0 to 35 percent. Soils on these landforms are moderately deep, well developed, with loamy and clayey textures. These soils are classified as Typic Argiborolls. Rock outcrop generally is not found in this landscape component. The dominant potential natural vegetation is Idaho fescue, rough fescue, and sagebrush series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA88-M332En

LOW RELIEF HILLS: COARSE TERTIARY SEDIMENTS

Location: This LTA is located throughout the Snowcrest mountains and basins in southwest Montana. This area is drained by the Ruby River in the Jefferson River Basin.

Acreage by Subsection

88-M332En	22,697

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in non-glaciated mountains composed of gentle to moderate slopes. Parent materials include Tertiary conglomerates, with quartzite matrix and limestone, sedimentary and undifferentiated clasts.

Accessory Characteristics: Dominant soils are deep to very deep coarse sandy loams with numerous rock fragments. Vegetation varies from shrublands and grasslands to conifers. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). Elevation ranges from 2992 to 4035 meters (7600 to 10200 feet). Slopes range from 20 to greater than 60 percent, with dominant slopes 20 to 50 percent. This unit is moderately to highly dissected by streams with the stream patterns being dendritic to subparallel.

LTA components: This landtype association consists of mountain slopes.

Mountain slopes formed in residuum and colluvium derived from Tertiary conglomerates. Dominant soils include Calcic Cryoborolls and Typic Cryoborolls under mountain big sagebrush and Idaho fescue series. Under Douglas-fir, subalpine fir and whitebark pine series Typic Cryochrepts are present. Rock outcrop occurs on 10 to 30 percent of this unit.

Compiled by: Annie Greene, Beaverhead-DeerLodge National Forest

LTA90-M332Ea

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located north of Electric Peak in the Little Blackfoot drainage of the Clark Fork basin.

Acreage by Subsection

90-M332Ea	4,492

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are old landslide deposits underlain by volcanic rock.

Accessory Characteristics: The primary soils are very deep and have clayey subsoils. The vegetation is coniferous forest. Mean annual precipitation ranges from 50 to 63 centimeters (20 to 25 inches). The elevation range of this LTA is 1799 to 2012 meters (5900 to 6600 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being deranged. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of landslides.

Landslides are formed in landslide deposits associated with volcanic bedrock. Slope gradients range from 10 to 40 percent. Soils on these landforms are very deep and well developed. They have moderately fine textured surface layers and high subsoil clay accumulations. They typically have silty clay loam surface textures. Subsoils are silty clay loam and silty clay with more than 35 percent rock (mostly gravel and cobble). These soils are classified as Mollic Cryoboralfs. Inclusions of Typic Cryaquolls are in bogs. The dominant potential natural vegetation is subalpine fir, spruce and Douglasfir.

Compiled by: Larry Laing, Helena National Forest

LTA90-M332Eb

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located near Fleecer Ridge on the Beaverhead-Deerlodge National Forest in southwest Montana in the upper Jefferson River Basin.

Acreage by Subsection/Subsection

90-M332Eb 3,901

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain landscape setting and is composed of slumps and landflows. Parent materials are slump and landflow deposits underlain by siltstone and shale bedrock.

Accessory Characteristics: The primary soils are deep with loamy and clayey textures. The vegetation is a mosaic of mountain grasslands and coniferous forest. Mean annual precipitation ranges from 46 to 51 centimeters (18 to 20 inches). The elevation range of this LTA is 1829 to 2287 meters (6000 to 7500 feet). The dominant slopes have gradients of 10 to 35 percent. This LTA is moderately dissected by streams. The dominant stream pattern is parallel with local deranged areas. Wetlands are a major component of this LTA.

LTA Components: This landtype association consists of slumps and landflows.

Slumps and landflows are formed in siltstone and shale bedrock. Slope gradients range from 10 to 45 percent. Soils on these landforms are deep, moderately developed, with loamy and clayey textures. These soils are classified as Argic Cryoborolls and Typic Cryoboralfs. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir and subalpine fir series. This component represents 100 percent of this LTA.

Compiled by: Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA90-M332En

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located throughout the Snowcrests and Gravelly mountains and basins in southwest Montana. This area is drained by the Ruby and Madison Rivers in the Jefferson River Basin.

Acreage by Subsection

90-M332En 73,061

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both glaciated and non-glaciated mountain areas. These units occur in soft sediments and also include collapsed glacial deposits in soft sediments. Landflows are characterized by undulating or steep micro-relief and indications of recent movement, such as slip scars, cracks or leaning trees. Landflows have many seeps, springs and depressions often containing small ponds or bogs. The drainage pattern is deranged, so runoff and groundwater collect in depressions.

Accessory Characteristics: Soils are deep to very deep coarse sandy loams to clays depending on parent material. Course fragments can be present. The vegetation is often mosaic with mixed grassland, shrubland and conifers. Aspens, sedges, wet forbs and grasses are associated with the depressional areas and high water tables. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is from 1951 to 2866 meters (6400 to 9400 feet). Slopes range from 5 to 50 percent, dominant slopes are 10 to 30 percent.

LTA Components: This landtype association consists of landflows.

Landflows (landslide deposits) formed in residuum of varying parent materials. On Cliff Lake bench, young Tertiary unconsolidated fluvial and lacustrine silts and sands are collapsing under recent volcanic flows. On the east side of the Ruby River, landslides are common in heavy clays from weathered shales. In the southwest area of the Snowcrests a conglomerate is weathering into coarse sands and collapsing with increased slope gradients. Other landslides are evident throughout the area. Dominant soils include Argic Pachic Cryoborolls under mountain big sage, Idaho fescue, tufted hairgrass and aspen series. Under Douglas-fir and subalpine fir series Typic Cryoboralfs are common. Minor amounts of Histic Cryaquolls and Histosols occur under sedge and willow series. Coarse fragments are common in the conglomerates and areas of collapsing glacial till.

Compiled by: Annie Greene, Beaverhead-DeerLodge National Forest

LTA90-M332E
LTA90-M331A

MASS WASTING: MIXED GEOLOGY

Location: This LTA is located in the Madison, Tobacco Root, Fleece, Pioneer, Anaconda Pintlar, Beaverhead, Lima Peaks, and Tendoy Mountains. These are in southwest Montana in the Jefferson and Madison River Basins.

Acreage by Section/Subsection

90-M332E	25,903	(Section except for M332Ea, M332Eb, M332En)
90-M331Am	11,231	
90-M332Ap	55,734	

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a foothills to mountain landscape setting which is typically composed of deep bedrock (hundreds of feet thick) and surficial (tens of feet thick) mass failures, both translational and rotational. Parent materials are landslide deposits, colluvium, and residuum derived mostly from Cretaceous and Tertiary shales and sandstones.

Accessory Characteristics: The primary soils are deep, silty clay loams, silty clays, and clays. The vegetation is a mosaic of subalpine coniferous forest, montane coniferous forest, and subalpine and mountain grasslands. Mean annual precipitation ranges from 36 to 102 centimeters (14 to 40 inches). The elevation range of this LTA is 2012 to 2804 meters (6600 to 9200 feet). The dominant slopes have gradients of 20 to 35 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being deranged to dendritic. Wetlands and small ponds are a major component of this LTA.

LTA Components: This landtype association consists of scarp slopes and landslide deposits.

Scarp slopes are formed in colluvium, residuum, and sometimes old glacial deposits. Slope gradients range from 20 to 70 percent. Soils on these landforms are very shallow to shallow, weakly developed, channery and flaggy sandy loams, loamy fine sands, clay loams, and silty clays, and clays. These soils are classified as Typic Cryorthents and Typic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is tufted hairgrass, and whitebark pine subalpine fir series; numerous early successional forb communities and primary succession. This component represents 10 percent of this LTA.

Landslide deposits and mountain slopes are formed in colluvium, residuum, old landslide deposits, and sometimes old glacial deposits (Bull Lake). Slope gradients range from 10 to 50 percent. Soils on these landforms are deep, moderately well developed, silty clay loams, silty clays and clays. These soils are classified as Aquic, Mollic, and Typic Cryoboralfs, Typic Argiborolls, and Argic Pachic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential vegetation is tufted hairgrass, whitebark pine-subalpine fir, spruce, subalpine fir, aspen, and Idaho Fescue series. This component represents 85 percent of this landscape component.

Compiled by: Dan Svoboda, Beaverhead-Deer Lodge National Forest

LTA92-M332E
LTA92-M332B
LTA92-M332D

COLLUVIAL DEPOSITS: MIXED GEOLOGY

Location: This LTA is located throughout the Helena National Forest.

Acreage by Section

92-M332E	3,557
92-M332B	6,383
92-M332D	12,928

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of mountain slopes and ridges. Parent materials are colluvial deposits, in basins and on toeslopes, typically influenced by metasedimentary and volcanic rocks.

Accessory Characteristics: The primary soils are very deep and have loamy or clayey subsoils. The vegetation is coniferous forest. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1464 to 2135 meters (4800 to 7000 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is highly dissected (but weakly incised) by streams, with the dominant stream pattern being parallel or subparallel. Wetlands are a major inclusion in this LTA.

LTA Components: This landtype association consists of colluvial deposits.

Colluvial deposits are derived from metasedimentary and volcanic rock. Some areas are also influenced by limestone colluvium. Slope gradients range from 10 to 50 percent. Soils on these landforms are very deep and weakly to well developed. They have moderately fine textured surface layers and high subsoil clay accumulations. They typically have very cobbly loam or cobbly silt loam surface textures. Subsoils are very cobbly loam, clay loam or silty clay loam. These soils are classified as Typic Cryochrepts, Typic Cryoboralfs, and Argic Cryoborolls. Inclusions of Aquic Cryoborolls, Aquic Cryoboralfs and Typic Cryaquepts are associated with seeps and springs. The dominant potential natural vegetation is subalpine fir, spruce and Douglasfir.

Compiled by: Larry Laing, Helena National Forest

CHAPTER 10

LTA Descriptions

Section M332G Blue Mountains

This Section occurs mostly in northeast Oregon, but extends a short distance into the Northern Region in west central Idaho. Sixteen LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. Map unit descriptions are preceded by the following illustrations:

Figure 40: Map showing location of M332G within the Northern Region

Figure 41: M332G landscape photograph
Near Pittsburgh Saddle, Nez Perce National Forest

Figure 42: Map showing distribution of LTAs within M332G

Figure 43: Bar chart showing abundance of landform groups in M332G

Figure 44: Bar chart showing abundance of geologic material groups in M332G

LTA10-M332G

VALLEYS: RECENT COARSE ALLUVIUM

Location: This unit is located in valley bottoms along larger streams in north central Idaho, in the Snake and Salmon River Basins.

Acreage by Section

10-M332G	433

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on valley bottom landscape settings and consists of floodplains and low terraces. Parent materials are recent alluvial deposits derived from granite, schist, quartzite, gneiss, basalt, or volcanics.

Accessory Characteristics: The primary soils are very deep loams or silt loams over gravelly or cobbly sand or loamy sand substrata. The vegetation is a mosaic of shrubland and dry coniferous forest, and grassland. Mean annual precipitation ranges from 40 to 65 centimeters (15 to 25 inches). The elevation range is 350 to 550 meters (1200 to 2000 feet). The dominant slopes gradients are 0 to 10 percent. This unit is moderately dissected by streams; the dominant stream pattern is dendritic. Wetlands are seldom a major component of this unit.

LTA Components: This landtype association consists of low stream terraces and floodplains.

Low terraces and floodplains are formed in mixed coarse textured alluvium. Slope gradients range from 1 to 10 percent. Soils on this landform are very deep and well to moderately well drained. These soils are weakly to moderately developed loams and silt loams over sand and gravel to cobble-sized rocks. The dominant soils are classified as Typic Xerofluvents. Rock outcrops do not occur in this landscape component. The dominant potential natural vegetation is dry coniferous forest, shrubland, and grassland.

Compiled by: Pat Green, Nez Perce National Forest

LTA12-M332G

VALLEYS: OUTWASH AND OLDER COARSE ALLUVIUM

Location: This unit is located in major river valleys in west central Idaho in the Salmon and Snake River Basins.

Acreage by Section

12-M332G	5,193

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs on valley bottoms of canyon breaks and is dominated by old high terraces. These occur with low flood plains and alluvial fans. Parent materials are mixed alluvium underlain by undifferentiated lithology.

Accessory Characteristics: The primary soils are very deep sands, sandy loams, and loams over cobbles and gravels. The vegetation is a mosaic of grassland and coniferous forest with some unvegetated cobble and sand bars. Mean annual precipitation ranges from 51 to 64 centimeters (15 to 25 inches).

The elevation range is 450 to 750 meters (1200 to 2500 feet). The dominant slopes have gradients of 1 to 30 percent. This unit is adjacent to large rivers and may be dissected by smaller streams. In low floodplains and fans, wetlands and cobble and sand bars are numerous.

LTA Components: This landtype association consists of older terraces, floodplains, and alluvial fans.

Old terraces are formed in old alluvium and loess. Slope gradients range from 1 percent on terrace floors to near vertical on truncated terrace faces. Soils on these landforms are very deep, moderately developed sandy loams and loams with loamy substrata. These soils are classified as Calcic Haploxerolls. Rock outcrop is uncommon. The dominant potential natural vegetation series are bluebunch wheatgrass and ponderosa pine. This component represents 65 percent of this unit.

Floodplains are formed in recent alluvium of mixed lithology. Slope gradients range from 1 to 3 percent. Soils on these landforms are deep to very deep, poorly developed stratified sands, gravels, cobbles and some fine material. These soils are classified as cobbly Typic Xerofluvents. Rock outcrop is uncommon. The dominant potential natural vegetation series are bluebunch wheatgrass and ponderosa pine. This component represents 20 percent of this unit.

Alluvial fans are formed in coarse recent alluvium at the mouth of tributary streams. Slope gradients range from 5 to 30 percent. Soils on these landforms are very deep, poorly developed, poorly stratified sands, gravels, cobbles and boulders. These soils are classified as cobbly Typic Xerofluvents and Udifluvents. Rock outcrop is uncommon. Plant communities are often dominated by willow, cottonwood, and white alder near streams and Douglas-fir or ponderosa pine series on drier positions. This component represents 15 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA17-M332G

HILLS AND PLATEAUS: LOESS

Location: This unit is located in west-central Idaho on the Palouse and Camas Prairies.

Acreage in Section

17-M332G 9,801

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills. Parent materials are a thick layer 6+ feet) of wind-blown loess underlain primarily by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay loam subsurface textures. The vegetation is a mosaic of prairie grasslands with forest vegetation at the higher elevations. Mean annual precipitation ranges from 38 to 76 cms. (15 to 30 inches). The elevation range is 610 to 914 meters (2000 to 3000 feet). The dominant slopes have gradients of 0 to 30 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in wind-blown loess. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam and silty clay loam subsurface textures. These soils are classified as Ultic Argixerolls, Ultic Haploxeralfs, and Pachic Ultic Haploxerolls. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in the prairie grasslands and ponderosa pine, Douglas-fir, and grand fir in forested areas. This component represents 90 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA22-M332G

BREAKS: MODERATELY WEATHERED GRANITICS

Location: This unit is located along streams and rivers in west central Idaho in the Snake River Basin.

Acreage by Section

22-M332G	18,597

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is canyon breaks and is composed of dissected stream breaks. Parent materials are moderately weathered Jurassic granodiorite.

Accessory Characteristics: The primary soils are moderately deep to deep gravelly loams and sandy loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 38 to 127 centimeters (15 to 50 inches). The elevation range is 450 to 2400 meters (1500 to 8000 feet). The dominant slopes have gradients of 50 to more than 80 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in residuum and colluvium of granitic lithology. Soils on these landforms are shallow to very deep, moderately developed gravelly loams and sandy loams with very gravelly or cobbly loamy or sandy substrata. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation series at low elevations is bluebunch wheatgrass, at mid elevations Douglas-fir and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA24-M332G

BREAKS: VOLCANICS

Location: This unit is located along streams and rivers in west central Idaho.

Acreage by Section

24-M332G	420,518

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is in canyons and is composed of dissected stream breaks. Parent materials are poorly to moderately weathered Miocene basalt, Seven Devils volcanics and included limestone.

Accessory Characteristics: The primary soils are moderately deep to deep loams and cobbly loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 33 to 89 centimeters (13 to 35 inches). The elevation range is 275 to 1700 meters (900 to 5500 feet). The dominant slopes have gradients of 50 to more than 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in mixed volcanic ash influenced loess, residuum and colluvium of volcanic lithology. Soils on these landforms are moderately deep to deep, moderately developed cobbly loams and loams with loamy or clayey substrata. These soils are classified as Ultic Argixerolls and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass, and at mid elevations Douglas-fir and grand fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA26-M332G

BREAKS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located along streams and rivers in the Seven Devils Mountains of west central Idaho in the Snake and Salmon River Basins.

Acreage by Section

26-M332G	29,535

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of dissected stream breaks. Parent materials are moderately weathered gneiss, quartzite, and schist associated with the West Idaho Suture Zone.

Accessory Characteristics: The primary soils are moderately deep to deep sandy loams and loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 46 to 114 centimeters (17 to 50 inches). The elevation range is 500 to 2300 meters (1600 to 7700 feet). The dominant slopes have gradients of 50 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in mixed volcanic ash influenced loess, residuum and colluvium of felsic metamorphic lithology. Soils on these landforms are moderately deep to very deep, moderately developed loams and sandy loams with sandy or loamy substrata. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation series at low elevations is bluebunch wheatgrass and Idaho fescue, at mid elevations Douglas-fir and grand fir, and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA42-M332G

STEEP GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This unit is located in high elevation glaciated areas of the Seven Devils Mountains of west central Idaho in the Salmon River and Snakeriver basins.

Acreage by Section

42-M332G	21,164

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of steep glacial trough walls and cirques. Parent materials are poorly weathered andesite and rhyolite associated with Seven Devil's volcanics, and included limestone of the Martin Bridge formation.

Accessory Characteristics: The primary soils are shallow to deep gravelly loams. The vegetation is coniferous forest with inclusions of herbaceous dominated openings. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range is 1200 to 2600 meters (4000 to 8600 feet). The dominant slopes have gradients of 50 percent to near vertical. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands and lakes are significant inclusions in basins and toeslopes.

LTA Components: This landtype association consists of dissected trough walls and cirque headwalls.

Dissected troughwalls are formed in mixed volcanic ash influenced loess, till, residuum and colluvium of volcanic and metasedimentary lithology. Slope gradients range from 50 to 80 percent. Soils on these landforms are moderately deep to deep, weakly developed gravelly loams and sandy loams with very cobbly loam substrata. These soils are classified as Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation series at mid elevations is grand fir, and at high elevations subalpine fir.

Cirque headwalls are formed in till, residuum, and colluvium of volcanic and metasedimentary lithology. Slope gradients range from 50 percent to near vertical. Soils on these landforms are shallow to moderately deep, weakly developed gravelly loams with cobbly loam substrata. These soils are classified as Dystric Cryochrepts and Entic Cryumbrepts. Rock outcrop may be 50 percent of the unit. The dominant potential natural vegetation is subalpine fir, whitebark pine/subalpine fir, and herbaceous or shrub dominated openings.

Compiled by: Pat Green, Nez Perce National Forest

LTA51-M332G

GLACIATED MOUNTAIN SLOPES: GRANITIC

Location: This unit is located in mid to high elevation glaciated areas of the Seven Devils Mountains of west central Idaho in the Salmon and Snake River basins.

Acreage by Section

51-M332G	1,459

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of gently to moderately sloping alpine glaciated lands, comprising moraines. Parent materials are poorly weathered till, residuum, and colluvium associated with Jurassic granite.

Accessory Characteristics: The primary soils are deep to very deep loams and sandy loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 89 to 114 centimeters (35 to 45 inches). The elevation range is 1600 to 2200 meters (5300 to 7200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being pinnate. Wetlands are minor inclusions in basins and depressions.

LTA Components: This landtype association consists of moraines.

Moraines are formed in mixed volcanic ash influenced loess and glacial till of granitic lithology. Slope gradients range from 5 to 50 percent. Soils on these landforms are moderately deep to very deep, weakly developed loams and sandy loams with cobbly, loamy sand and sand substrata. These soils are classified as Dystric Cryochrepts. Rock outcrop is less than 15 percent of the unit. The dominant potential natural vegetation series at mid elevations is grand fir, and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA54-M332G

GLACIATED MOUNTAIN SLOPES: VOLCANICS

Location: This unit is located in high elevation glaciated areas of west central Idaho in the Snake and Salmon River basins.

Acreage by Section

54-M332G	16,458

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of gently to moderately sloping alpine glaciated lands, including moraines, cirque basins, and trough bottoms. Parent materials are poorly weathered Seven Devils volcanics and included limestone.

Accessory Characteristics: The primary soils are deep to very deep gravelly loams, loams, and silt loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 114 centimeters (30 to 45 inches). The elevation range is 1750 to 2500 meters (5700 to 8200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being pinnate. Wetlands and lakes are significant inclusions in basins and depressions.

LTA Components: This landtype association consists of moraines, cirque basins, and trough bottoms.

Moraines are formed in mixed volcanic ash influenced loess and glacial till of volcanic or limestone lithology. Slope gradients range from 5 to 50 percent. Soils on these landforms are moderately deep to very deep, weakly developed gravelly loams and silt loams with cobbly sandy loam substrata. These soils are classified as Dystric Cryochrepts. Rock outcrop is less than 15 percent of the unit. The dominant potential natural vegetation series at mid elevations is grand fir and at high elevations subalpine fir. This component is 60 percent of the map unit.

Cirque basins are formed in volcanic ash influenced loess and glacial till of volcanic or limestone lithology. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep to very deep, weakly developed gravelly loams and loams with very cobbly loam substrata. These soils are classified as Dystric Cryochrepts. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation series is subalpine fir. This component is 20 percent of the map unit.

Trough bottoms are formed in mixed volcanic ash influenced loess, glacial till and stratified outwash of volcanic or limestone lithology. Slope gradients range from 1 to 30 percent. Soils in these landforms are very deep, weakly developed gravelly loams and loams with very cobbly sandy loam or loam substrata. These soils are classified as Dystric Cryochrepts and Entic Cryumbrepts. The dominant potential natural vegetation series is subalpine fir. This component is 20 percent of the map unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA59-M332G

MOUNTAIN SLOPES AND RIDGES: GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in mountains and canyons of north central Idaho and central Idaho in the Salmon and Clearwater River basins.

Acreage by Section

59-M332G 6,706

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is colluvial mountain slopes. Parent materials are moderately weathered gneiss, schist and quartzite associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams, loams and sandy loams. The vegetation is dominantly coniferous forest, with some grassland at low elevations on south aspects. Mean annual precipitation ranges from 64 to 125 centimeters (25 to 50 inches). The elevation range is 700 to 2438 meters (2300 to 8000 feet). The dominant slopes have gradients of 35 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in volcanic ash influenced loess, residuum and colluvium of felsic lithology. Soils on these landforms are deep to very deep, moderately developed silt loams, loams and sandy loams with sandy or substrata. Soils on low elevations on south aspects are Ultic Haploxerolls. At mid elevations soils are classified as Andic Dystrochrepts and Typic Dystrochrepts, and at high elevations they are Andic Cryochrepts and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass, at mid elevations, Douglas-fir and grand fir, and at high elevations, subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest

LTA62-M332G

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Seven Devils Mountains of west central Idaho in the Snake River Basin.

Acreage by Section

62-M332G 2,305

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a nonglaciaded steep mountain slope landscape setting, below the zone of strong frost-churning, and is typically composed of moderately dissected mountain slopes, ridge tops, and minor amounts of narrow valley bottoms. Parent materials are colluvium and residuum underlain by weakly weathered granitic bedrock.

Accessory Characteristics: The primary soils are moderately deep to deep loams and sandy loams with very cobbly sandy loam, loamy sand or sand substrata. The vegetation is bunchgrass and coniferous forest. Mean annual precipitation ranges from 64 to 114 centimeters (25 to 45 inches). The elevation range is 1200 to 2000 meters (4100 to 6700 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of mountain slopes and ridge tops.

Soils are formed in colluvium and residuum. Slope gradients range from 35 to 55 percent. Soils on this landform are somewhat excessively drained or well drained. The soils are weakly developed. The dominant soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, and Dystric Cryochrepts. Rock outcrop occurs on about 10 percent of this component. The dominant potential natural vegetation is Douglas-fir and Idaho fescue series, and at higher elevations, grand fir and subalpine fir series.

Compiled by: Pat Green, Nez Perce National Forest

LTA64-M332G

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This unit is located along streams and rivers, and adjacent to basalt plateaus in west central Idaho.

Acreage by Section

64-M332G	133,556

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is colluvial mountain slopes and usually is adjacent to steam breaks or plateaus. Parent materials are poorly to moderately weathered Columbia River basalt, Seven Devils volcanics and included limestone of the Martin Bridge formation.

Accessory Characteristics: The primary soils are moderately deep to deep loams and cobbly loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 30 to 89 centimeters (12 to 35 inches). The elevation range is 240 to 2250 meters (800 to 7300 feet). The dominant slopes have gradients of 35 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in mixed volcanic ash influenced loess, residuum and colluvium of volcanic lithology. Slope gradients range from 35 to 50 percent. Soils on these landforms are moderately deep to deep, moderately developed cobbly loams and loams with loamy or clayey substrata. These soils are classified as Ultic Argixerolls and Dystric Cryochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation series at low elevations is bluebunch wheatgrass, at mid elevations Douglas-fir and grand fir, and at high elevations subalpine fir/blue.

Compiled by: Pat Green, Nez Perce National Forest

LTA72-M332G

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Seven Devils Mountain Range of west central Idaho in the Snake and Salmon River Basins.

Acreage by Section

72-M332G	433

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at high elevations in a mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum underlain by weakly weathered granitic rocks.

Accessory Characteristics: The primary soils are deep loams and sandy loams with very cobbly loamy sand and sand substrata. The vegetation is coniferous forest and montane parklands. Mean annual precipitation ranges from 76 to 102 centimeters (30 to 40 inches). The elevation range is from 1500 to 1800 meters (5000 to 6000 feet). The dominant slopes have gradients of 15 to 50 percent. This unit is slightly dissected by streams with the dominant stream pattern being parallel, but grading to weakly dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included in this map unit.

LTA Components: This landtype association consists of frost shattered mountain slopes and ridge tops.

Frost shattered convex ridges and slopes are formed in thin or mixed volcanic ash influenced loess and residuum of granitic lithology. Soils on this landform are deep and well drained, poorly developed gravelly loams or sandy loams with very gravelly or cobbly loamy sand or sand substrata. These soils are classified as Dystric Cryochrepts, Typic Dystrochrepts, and Entic Cryumbrepts. Rock outcrop is less than 5 percent of this unit. The dominant potential natural vegetation series at mid elevations is grand fir, and at higher elevations subalpine fir and herbaceous openings. This component represents 90 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA73-M332G

FROST SHATTERED MOUNTAIN RIDGE TOPS: VOLCANICS

Location: This unit is located in the Seven Devils Mountain Range of west central Idaho in the Snake and Salmon River Basins

Acreage by Section

73-M332G 6,159

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at high elevations in a mountain ridge landscape setting which is typically composed of frost shattered ridge tops and mountain slopes. Parent materials are colluvium and residuum of andesite and rhyolite of the Seven Devils volcanics and included limestone of the Martin Bridge formation.

Accessory Characteristics: The primary soils are deep loams and sandy loams that have numerous angular rock fragments in the profile. The vegetation is coniferous forest and montane parkland. Mean annual precipitation ranges from 76 to 140 centimeters (30 to 55 inches). The elevation range is 1500 to 2400 meters (5000 to 8000 feet). The dominant slopes have gradients of 15 to 50 percent. This unit is slightly dissected by streams, with the dominant stream pattern being parallel, but grading to weakly dendritic. Wetlands are a minor component of this unit. Small areas of glaciation are included.

LTA Components: This landtype association consists of frost shattered mountain slopes and ridge tops.

Frost shattered mountain slopes are formed in thin or mixed volcanic ash influenced loess and residuum of volcanic and metasedimentary lithology. Soils on this landform are deep and well drained, weakly developed gravelly loams or silt loams with very gravelly or very cobbly loamy or sandy loam substrata. The dominant soils are classified as Dystric Cryochrepts and Entic Cryumbrepts. Rock outcrop occurs on less than 5 percent of this landscape component. The dominant potential natural vegetation series at mid-elevations is grand fir, and at higher elevations subalpine fir and herbaceous openings. This component represents 90 percent of this unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA82-M332G

LOW RELIEF HILLS: VOLCANICS

Location: This unit is located on plateaus and broad ridgetops above volcanic canyonlands in west central Idaho, in the Snake and Salmon River Basins.

Acreage by Section

82-M332G	44,956

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is plateaus developed primarily in loess and moderately weathered residuum of Columbia River basalt.

Accessory Characteristics: The primary soils are deep to very deep silt loams and loams. The vegetation is dominantly grassland and minor coniferous forest. Mean annual precipitation ranges from 30 to 127 centimeters (12 to 50 inches). The elevation range is 240 to 1800 meters (800 to 5900 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of plateaus.

Plateaus are formed in loess and residuum of volcanic lithology. Soils on these landforms are deep to very deep, moderately developed silt loams with clay or silty clay substrata. These soils are classified as Andeptic Cryoboralfs. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation series is bluebunch wheatgrass. At mid-elevations, Douglas-fir and grand fir are dominant. Western red cedar occurs in the north part of the Clearwater River basin.

Compiled by: Pat Green, Nez Perce National Forest

LTA90-M332G

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in mountain slopes and canyonlands of west central Idaho.

Acreage by Section

90-M332G	23,333

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is mass wasted slopes. They are often adjacent to stream channels. Parent materials for this unit are moderately to well weathered parent materials of any lithology, but in this Section are dominantly volcanics.

Accessory Characteristics: The primary soils are deep to very deep loams and cobbly loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 30 to 102 centimeters (12 to 40 inches). The elevation range is 275 to 1500 meters (900 to 5000 feet). The dominant slopes have gradients of 30 to 80 percent. This unit is poorly to moderately dissected by streams, and while the dominant pattern is parallel, the stream pattern may be deranged by slope movement. Wetlands are sometimes a minor component.

LTA Components: This landtype association consists of mass wasted slopes, including benches and scarps.

Mass wasted slopes are formed in mixed volcanic ash influenced loess, residuum and colluvium of dominantly volcanic lithology. Soils on these landforms are deep to very deep, moderately developed cobbly loams and loams with loamy or clayey substrata. These soils are classified as Ultic Argixerolls and Typic Dystrochrepts. Landslide scarps may have shallower soils. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation series at low elevations is bluebunch wheatgrass, and at mid elevations, Douglas-fir and grand fir.

Compiled by: Pat Green, Nez Perce National Forest

CHAPTER 11

LTA Descriptions

Section M333A-Okanogan Highlands

This Section occurs in northeast Washington and northern Idaho and is dominated by Continentally Glaciated Mountains. Nineteen LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. Map unit descriptions are preceded by the following illustrations:

Figure 45: Map showing location of M333A within the Northern Region

Figure 46: M333A landscape photograph
Selkirk Mountains, Idaho Panhandle National Forests

Figure 47: Map showing distribution of LTAS within M333A

Figure 48: Bar chart showing abundance of landform groups within M333A

Figure 49: Bar chart showing abundance of geologic material groups within M333A

LTA10-M333A

VALLEYS: RECENT COARSE ALLUVIUM

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille, Kootenai and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

10-M333A	38,951

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting at elevations that range from low to high. The unit is typically composed of wide glacial trough bottoms. Parent materials are surface volcanic ash overlying mostly outwash with a narrow deposit of recent alluvium near the stream. These materials are usually derived from granitic bedrock sources.

Accessory Characteristics: The primary soils are generally deep stratified sands. The vegetation is a mosaic of mixed coniferous and alpine forest with associated riparian plants. Mean annual precipitation ranges from 76 to 152 centimeters (30 to 60 inches). The elevation range of this unit is 610 to 1829 meters (2000 to 6000 feet). The dominant slopes have gradients of 2 to 15 percent.

LTA Components: This landtype association consists of toeslopes and stream terraces, floodplains, and alluvial basins.

Toeslopes and stream terraces are formed in coarse alluvium, some stratified. These toeslopes and terraces have slope gradients that range from 2 to 20 percent. Soils on these landforms are deep, poorly developed and consist mostly of sand and gravel. The major soils are classified as Andic Dystrochrepts and Andic Cryochrepts, along with Typic Udivitrands and Vitric Haplocryands. The dominant potential natural vegetation series on the well drained, high elevation sites are subalpine fir with western hemlock and western redcedar occurring at low to mid-elevations. This component represents about 60 percent of the map unit.

Floodplains and alluvial basins are formed in coarse, stratified and unstratified alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, poorly developed and consist mostly of sand and gravel. The major soils are classified as Humic Udivitrands, Vitric Fulvicryands, Pachic Haplumbrepts and Typic Haplaquepts. The dominant potential natural vegetation series are subalpine fir in the higher elevations and cold air drainage areas, with western redcedar in the low and mid-elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA11-M333A

VALLEYS: LACUSTRINE SEDIMENTS

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille, Kootenai and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

11-M333A	220,526

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting at low elevations. The unit is typically composed of glacial Lacustrine plains, benches and draws. Parent materials are surface volcanic ash overlying silty lake sediments.

Accessory Characteristics: The primary soils are deep, silty, lacustrine sediments from unnamed glacial lakes. The vegetation is a mosaic of mixed coniferous forest. Mean annual precipitation ranges from 64 to 76 centimeters (25 to 30 inches). The elevation range of this unit is 536 to 762 meters (1760 to 2500 feet). The dominant slopes have gradients of 0 to 55 percent.

LTA Components: This landtype association consists of flat plains, benches and draws.

Flat plains, benches and draws are formed in mostly deep fine silty or coarse-silty lacustrine sediments. Some sandy and loamy sediments also occur. Slope gradients range from 0 to 60 percent. Soils on these landforms are deep, poorly developed and consist mostly of silt with some sands and loams. The deposits found around Bonners Ferry are calcareous. The major soils are classified as Typic Udivitrands. Other soils which occur are Andic Eutrochrepts and Andic Fragixeralfs. The dominant potential natural vegetation series are western redcedar, grand fir, and Douglas-fir.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA12-M333A

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIAL DEPOSITS

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille, and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

12-M333A	323,513

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting at elevations that range from low to high. The unit is typically composed outwash plains, alluvial fans and glacial terraces. Parent materials are surface volcanic ash overlying mostly outwash with a narrow deposit of recent alluvium near the stream. These materials are derived from belt and granitic bedrock sources.

Accessory Characteristics: The primary soils are deep, intermixed and stratified gravels, sands, and silts. The vegetation is a mosaic of mixed coniferous and alpine forest with associated riparian plants. Mean annual precipitation ranges from 76 to 152 centimeters (30 to 60 inches). The elevation range of this unit is 536 to 1646 meters (1760 to 5400 feet). The dominant slopes have gradients of 0 to 20 percent, but some steep terrace escarpments have gradients up to 75 percent.

LTA Components: This landtype association consists of outwash plains, terraces and rolling surfaces.

Outwash plains and terraces and rolling surfaces are formed in coarse outwash and alluvium, some stratified. These plains and terraces have slope gradients that generally range from 2 to 20 percent. Soils on these landforms are deep, poorly developed and consist mostly of sand and gravel. The major soils on the well drained sites are classified as Andic Dystrochrepts and Andic Cryochrepts, along with Typic Udivitrands and Vitric Haplocryands. The major soils on the poorly drained sites are classified as Humic Udivitrands, Vitric Fulvicryands, Pachic Haplumbrepts and Typic Haplaquepts. The dominant potential natural vegetation series on the well drained, high elevation sites are subalpine fir, with western hemlock, western redcedar, grand fir and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation on the poorly drained sites is subalpine fir in the higher elevations and cold air drainage areas, with western redcedar in the low and mid elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA14-M333A

VALLEYS: RECENT FINE ALLUVIUM

Location: These units occur in the lower part of the Purcell Trench and the Pend Oreille River basin of northwestern Idaho.

Acreage by Section

14-M333A	14,384

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting at low elevations. The unit is typically composed low stream terraces, flood plains and bottom lands. Parent materials are surface volcanic ash overlying fine recent alluvium near streams. These materials are derived from belt and granitic bedrock sources.

Accessory Characteristics: The primary soils are deep, poorly drained, silt loams and very fine sandy loams. The vegetation is a mosaic of grass meadows with associated riparian plants. Mean annual precipitation ranges from 64 to 76 centimeters (25 to 30 inches). The elevation range is 640 to 914 meters (2100 to 3000 feet). The dominant slopes have gradients of 0 to 4 percent.

LTA Components: This landtype association consists of floodplains and bottom lands.

Floodplains and bottom lands are formed in fine alluvium. These landscapes have slope gradients that generally range from 0 to 10 percent. Soils on these landforms are very deep and consist mostly of silt loams and very fine sands. The major soils are classified as Mollic Andaquepts, medial, nonacid, frigid; Typic Borosaprists, and Typic Haplaquolls, fine, mixed, frigid. The dominant vegetation consists of grasses, forbs and shrubs.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA20-M333A

BREAKS: METASEDIMENTARY (BELT)

Location: These units occur in the St. Joe, Coeur d'Alene and Clearwater Mountains of the Bitterroot range, which are part of the Clark Fork, Coeur d'Alene, St. Joe and Clearwater River basins of northwest Montana and northern Idaho.

Acreage by Section

20-M333A	17,556

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs primarily at low to mid elevations, on steep slopes adjacent to stream drainages. Parent materials are surface volcanic ash overlying weakly to moderately weathered quartzites, siltites and argillites from Precambrian metasedimentary bedrock. In Montana surface ash may or may not occur.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a small to moderate component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients that are greater than 60 percent. This unit is non-dissected to moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected stream breaks. Structural breaks are also included.

Stream breaks are the steep, mountain slopes adjacent to stream drainages, some of these steep slopes are dissected and other are not. The slope gradients range from 50 to greater than 100 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands with xeric phases of these on some southerly aspects. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop and scree occupy less than 10 percent to over 50 percent of the area. In western Montana the major soils are classified as Lithic Dystrochrepts, Typic Dystrochrepts, and Andic Dystrochrepts. The dominant potential natural vegetation on the well drained, moist sites are western redcedar, western hemlock and grand fir series; on drier sites grand fir and Douglas-fir. The dominant potential natural vegetation series on poorly drained sites is western redcedar.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA22-M333A

BREAKS: WEAKLY WEATHERED GRANITICS

Location: These units occur in the Selkirk Mountains of the Kootenai River basin of northern Idaho.

Acreage by Section

22-M333A	4,297

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs primarily at low to mid elevations, on steep slopes adjacent to stream drainages and along the Purcell trench. Parent materials are surface volcanic ash overlying glacial till, or lacustrine sediments, with an underlying bedrock consisting of granite, granodiorite or similar rocks of the Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are shallow to deep sands and sandy loams, with a small to moderate component of rock bedrock and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 102 centimeters (25 to 40 inches). The elevation range is 670 to 1341 meters (2200 to 4400 feet). The dominant slopes have gradients that are greater than 60 percent.

LTA Components: This landtype association consists of stream breaks with some structural breaks included.

Stream breaks are the steep, mountain slopes adjacent to stream drainages, some of these steep slopes are dissected and others are not. The slope gradients range from 50 to 100+ percent. Soils on these landforms are shallow to deep, weakly weathered and coarse textured. The major soils on the well drained sites are classified as Andic Dystrochrepts and Andic Xerochrepts on the drier sites. On open dry aspects the volcanic ash is thinner and the dominant soils here are Typic Xerochrepts. Rock outcrop and scree occupy less than 10 percent to over 50 percent of this area. The dominant potential natural vegetation on the more moist sites is western redcedar and western hemlock, with Douglas-fir on the dryer sites.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA28-M333A
LTA28-M333D

DISSECTED BREAKS: METASEDIMENTARY (BELT)

Location: These units occur in the Coeur d'Alene Mountains of the Bitterroot range, which are part of the Coeur d'Alene River basin of northern Idaho.

Acreage by Section

28-M333A	426
28-M333D	316,745

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, moderately steep to steep sloping, mountain sideslope and stream breaks landscape setting, which is typically composed of dissected lower mountain slopes and stream breaks comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly to moderately weathered quartzites, siltites and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 140 centimeters (25 to 55 inches). The elevation range of this unit is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 45 to 80 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. The landscapes of this area are all generally under 5000 feet and in a high rain-on-snow frequency area.

LTA Components: This landtype association consists of lower mountain slopes and breaks which have alternating dissected draws and spur ridges.

Dissected draws occur on moderately steep to steep slopes, and are formed in metasediments that consist of quartzites, siltites and argillites. The slope gradients range from 45 to 80 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils on the well drained sites within the draw are classified as Typic Udivitrands and Alfic Udivitrands. Xeric phases of these occur on some of the southerly aspects. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop or scree occupies 10 to 30 percent of this unit. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock and grand fir. The dominant potential natural vegetation on the poorly drained sites is western redcedar. This component represents about 50 percent of this unit

Non-dissected spur ridges occur on moderately steep to steep slopes and are formed in the same Belt metasediment rock types stated in the landscape component above. The slope gradients range from 45 to 80 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils are classified as Typic Udivitrands, with xeric phases on dryer, southerly aspects. Moderately weathered soils consist of Alfic Udivitrands and Alfic Vitrixerands. Rock outcrop and scree occupies 10 to 30 percent of this unit. The dominant potential natural vegetation is western redcedar, western hemlock, grand fir and Douglas-fir. This component represents about 50 percent of this unit.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA40-M333A

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille, Kootenai and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

40-M333A	6,270

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a steep, continental glaciated landscape setting, which is typically composed of steep glacial trough walls and headwalls. Substratum materials are glacial tills and residuum derived from mainly Precambrian metasediments composed of quartzites, siltites and argillites. Where these rocks have come in contact with intrusions of sills or the Kaniksu batholith they have been altered to schists, amphibolites, phyllites and other metamorphic rocks. The Shedroof conglomerate and Leola volcanics formations occur on the northern boundary of Idaho and Washington.

Accessory Characteristics: The primary soils are shallow to deep sandy loams, with inclusions of rock outcrop, scree and avalanche chutes. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range is 914 to 2344 meters (3000 to 7690 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of steep, dissected, mid to high elevation, continentally glaciated troughwalls and headwalls.

These steep, glaciated troughwalls and headwalls consist of glacial till or residuum derived from metasedimentary bedrock and other local bedrock sources. The slope gradients range from 50 to 110 percent. Soils on these landforms are shallow to deep, weakly weathered and medium textured. The major soils on the high elevation, well drained sites are classified as Andic Cryochrepts, Vitric Haplocryands, and Lithic Cryochrepts. Andic Cryumbrepts and Vitric Fulvicryands occur in the more poorly drained sites. The major soils at mid elevations, well drained sites are classified as Andic Dystrochrepts, Typic Udivitrands, and Lithic Dystrochrepts. Andic Haplumbrepts and Humic Udivitrands occur in the more poorly drained sites. Rock outcrop, scree and avalanche chutes commonly occur in this unit. The dominant potential natural vegetation on the high elevation, well drained sites are subalpine fir along with grassy balds. Western hemlock, western redcedar, grand fir and Douglas-fir occur at lower elevations. The dominant potential natural vegetation on the poorly drained sites are subalpine fir at the higher elevations and western redcedar at mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA41-M333A

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: These units occur primarily in the Selkirk Mountains of the Priest, Pend Oreille, Kootenai and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

41-M333A	22,952

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a steep, continental and alpine glaciated landscape setting, which is typically composed of steep glacial trough walls cirque headwalls and associated basins. Substratum materials are glacial tills and residuum derived from mainly Cretaceous or Tertiary aged Kaniksu batholith composed of granite, granodiorite or other rocks of similar composition.

Accessory Characteristics: The primary soils are shallow to deep sands and sandy loams, with a significant component of rock outcrop, scree and avalanche chutes. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range is 975 to 2250 meters (3200 to 7380 feet). The dominant slopes have gradients greater than 60 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and lakes are a major component of the cirque basin and narrow valley bottom of this unit.

LTA Components: This landtype association consists of steep, dissected, mid to high elevation, continentally and alpine glaciated trough walls, headwalls and associated basins and narrow bottoms.

The steep, glaciated trough walls and headwalls consist of glacial till or residuum derived from batholith that consists of granite, granodiorite or other local bedrock sources. The slope gradients range from 50 to 110 percent. Soils on these landforms are shallow to deep, weakly weathered and coarse to medium textured. The major soils on the high elevation, well drained sites are classified as Andic Cryochrepts, Vitric Haplocryands, and Lithic Cryochrepts. Andic Cryumbrepts and Vitric Fulvicryands occur in the more poorly drained sites. The major soils at mid elevations, well drained sites are classified as Andic Dystrochrepts, Typic Udivitrands, and Lithic Dystrochrepts. Andic Haplubrepts and Humic Udivitrands occur in the more poorly drained sites. Rock outcrop, scree and avalanche chutes commonly occur in this unit. The dominant potential natural vegetation on the high elevation, well drained sites is subalpine fir series along with grassy balds. Western hemlock, western redcedar, grand fir and Douglas-fir occur at lower elevations. The dominant potential natural vegetation on the poorly drained sites are subalpine fir at the higher elevations and western redcedar at mid and lower elevations. This component represents about 80 percent of this unit.

The cirque basins and narrow valley bottoms occur on gentle slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 0 to 35 percent. Soils on these landforms are mostly deep, weakly weathered and coarse to medium textured. The major well drained soils in the cirque basins and narrow valley bottoms are Andic Cryochrepts and Vitric Haplocryands. On poorly drained sites the major soils are Andic Cryumbrepts and Vitric Fulvicryands. The dominant potential natural vegetation is subalpine fir series. This component represents about 20 percent of the unit.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA46-M333A

ALPINE TROUGHS AND TROUGHWALLS: GRANITICS

Location: These units occur in the Selkirk Mountains of north Idaho.

Acreage by Section

46-M333A	30,843

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at higher elevations, in a gentle to steep, alpine glacial landscape setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are Mazama volcanic ash overlying weakly weathered granitic tills and bedrock of the Kaniksu Batholith.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures, and non-gravelly to very gravelly or cobbly sand, loamy sand and sandy loam subsurface layers. The vegetation is a mosaic of coniferous forest and rock outcrops. Mean annual precipitation ranges from 125 to 175cms (50 to 70 inches). The elevation range is 1524 to 2347 meters (5000 to 7700 feet). The dominant slopes range from 1 percent in the trough bottoms to more than 60 percent on the troughwalls. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and moist seeps are a major component of this unit.

LTA Components: This landtype association consists of glacial troughwalls and glacial trough bottoms.

The glacial troughwalls are formed in granitics of the Kaniksu Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 40 to more than 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures, and non-gravelly to very gravelly or cobbly sands, loamy sands, and sandy loam subsurface textures. These soils are classified as Andic Cryochrepts, Vitric Haplocryands, Andic Cryumbrepts and Lithic Cryochrepts. Some Spodosols occur at higher elevations. The soils sometimes have dense till substratums. Rock outcrop occurs on 10 to 30 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. This component represents about 70 percent of this unit.

The trough bottoms consist of Mazama ash overlying glacial till, glacio-fluvial sediments and alluvium. Slope gradients range from 1 to 30 percent. Soils on these landforms are generally deep, and consist mostly of silt loam and loam volcanic ash surface textures over a wide assortment of textures derived from till, alluvium and glacio-fluvial sediments. Many wet soils occur in these bottoms. The soils are classified as Ochrepts, Aquepts, Umbrepts and Cryands. Rock outcrop is uncommon. The dominant potential natural vegetation is subalpine fir. This component represents about 30 percent of this unit.

Compiled by: Gary Ford, Regional Office

LTA50-M333A

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

50-M333A	180,003

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a gentle to moderately steep valley bottom, mountain sideslope and ridge landscape setting at elevations that range from low to high. The unit is typically composed of dissected and non dissected mountain slopes, valleys and ridges comprised of alpine and continental till. Parent materials are surface volcanic ash overlying substratum materials of glacial tills derived from mainly Precambrian metasediments composed of quartzites, siltites and argillites. Where these rocks have come in contact with intrusions of sills or the Kaniksu batholith they have been altered to schists, amphiboles, phyllites and other metamorphic rocks. The Shedroof conglomerate and Leola volcanics formations occur on the, northern boundary of Idaho and Washington.

Accessory Characteristics: The primary soils are shallow to deep sandy loams, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range of this unit is 800 to 2062 meters (2625 to 6765 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected, continentally glaciated, convex ridges and concave valleys.

The glaciated convex ridges and mountain sideslopes were strongly scoured and then covered by varying thickness of glacial tills. The slope gradients range from near level to 60 percent. The drainage bottoms and toeslopes consist of deep glacial tills and glacio-fluvial materials. The slope gradients range from 0 to 40 percent. Soils on the ridge and mountain sideslopes landforms are shallow to deep, weakly weathered, and medium textured. Soils in the drainage bottoms and toeslopes are deep, weakly weathered, and medium textured. The major soils on the well drained sites are classified as Andic Cryochrepts and Andic Dystrochrepts, with Andic Xerochrepts on the dryer sites. The areas with deeper ash caps are Vitric Haplocryands and Typic Udivitrands. Andic Cryumbrepts-Andic Haplumbrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in the scoured ridge and mountain sideslope landforms. The dominant potential natural vegetation on the well drained, high elevation sites is subalpine fir with western hemlock, western redcedar, grand fir and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation on the poorly drained sites are subalpine fir at the higher elevations and cold air pockets at lower elevations, and western redcedar at the mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA51-M333A

LTA51-M333D

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: These units occur primarily in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

51-M333A	467,331
51-M333D	3,788

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a gentle to moderately steep valley bottom, mountain sideslope and ridge landscape setting at elevations that range from low to high. The unit is typically composed of dissected and non-dissected mountain slopes, valleys and ridges comprised of alpine and continental till. Parent materials are surface volcanic ash overlying substratum materials of glacial tills derived from Cretaceous Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are shallow to deep sands, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range is 800 to 2062 meters (2625 to 6765 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected, continentally glaciated, convex ridges and concave valleys.

The glaciated convex ridges and mountain sideslopes were strongly scoured and then covered by varying thickness of glacial tills. The slope gradients range from near level to 60 percent. The drainage bottoms and toeslopes consist of deep glacial tills and glacio-fluvial materials. The slope gradients range from 0 to 40 percent. Soils on the ridge and mountain sideslopes landforms are shallow to deep, weakly weathered, and sandy textured. Soils in the drainage bottoms and toeslopes are deep, weakly weathered, and sandy textured. The major soils on the well drained sites are classified as Andic Cryochrepts and Andic Dystrochrepts, with Andic Xerochrepts on the drier sites. The areas with deeper ash caps are Vitric Haplocryands and Typic Udivitrands, Andic Cryumbrepts-Andic Haplumbrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in the scoured ridge and mountain sideslope landforms. The dominant potential natural vegetation on the well drained, high elevation sites is subalpine fir with western hemlock, western redcedar, grand fir and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation on the poorly drained sites is subalpine fir at the higher elevations and cold air pockets at lower elevations, and western redcedar at the mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA60-M333A

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

60-M333A	124,084

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gentle to steep sloping, mountain sideslope and ridge landscape setting, which is typically composed of dissected and non-dissected mountain slopes, nival hollows and ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly to moderately weathered quartzites, siltites and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 152 centimeters (25 to 60 inches). The elevation range is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 20 to 70 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being parallel to dendritic.

LTA Components: This landtype association consists of dissected and non-dissected mountain slopes, nival hollows and ridges.

Dissected mountain slopes and nival hollows occur on moderately steep to steep slopes and are formed in metasediments that consist of quartzites, siltites and argillites. The slope gradients range from 35 to 70 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands with xeric phases of these occur on some of the southerly aspects; and Andic Dystrochrepts. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop and scree occupies less than 5 percent of this unit. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock, and grand fir. The dominant potential natural vegetation on the poorly drained sites is western redcedar. This component represents about 40 percent of this unit.

Non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes, and are formed in the same Belt Metasedimentary rock types stated in the landscape component above. The slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to deep and are medium textured. The major soils are classified as Typic Udivitrands; xeric phase on dryer, southerly aspects; Andic Dystrochrepts and Andic Xerochrepts. Moderately weathered soils consist of Alfic Udivitrands and Alfic Vitrixerands. Rock outcrop and scree occupies less than 5 up to 10 percent of the area. The dominant potential natural vegetation is western redcedar, western hemlock, grand fir and Douglas-fir. This component represents about 60 percent of this unit.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA61-M333A

MOUNTAIN SLOPES AND RIDGES: HIGHLY WEATHERED GRANITICS

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

61-M333A	16,288

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gentle to moderately sloping, mountain sideslope and ridge landscape setting, which is typically composed of dissected mountain slopes and ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying highly weathered granitics from Cretaceous Kaniksu Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep sands, sandy loams and loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 127 centimeters (25 to 50 inches). The elevation range is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is moderately to highly dissected, many of the draws do not have discernable active streams in the bottom. The dominant stream pattern tends to be dendritic.

LTA Components: This landtype association consists of dissected mountain slopes and ridges.

Dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 10 to 60 percent. Soils on these landforms are moderately deep to deep, highly weathered and coarse to medium textured. The major soils on both the well drained sites and the more poorly drained sites are classified as Typic Udivitrands, Typic Udivitrands, Alfic Udivitrands; xeric phases of these occur on some of the southerly aspects. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock, and grand fir. The dominant potential natural vegetation on the poorly drained sites are western redcedar.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA62-M333A

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHERED GRANITICS

Location: These units occur in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

62-M333A	162,063

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, gentle to moderately sloping, mountain sideslope and ridge landscape setting, which is typically composed of weakly dissected and non dissected mountain slopes, and ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly to moderately weathered granitics from Cretaceous Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are moderately deep to deep sands and sandy loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 127 centimeters (25 to 50 inches). The elevation range is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is weakly to non dissected by streams, with the dominant stream pattern being parallel when they occur.

LTA Components: This landtype association consists of weakly to non-dissected mountain slopes and ridges.

Weakly to non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 10 to 60 percent. Soils on these landforms are moderately deep to deep, weakly to moderately weathered and coarse to medium textured. The major soils are classified as Typic Udivitrands. The moderately weathered soils consist of Alfic Udivitrands. Xeric phases of these occur on some of the southerly aspects. The dominant potential natural vegetation is western redcedar, western hemlock, grand fir and Douglas fir.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA64-M333A

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: These units compose a basaltic plateau, located north and west of Hayden Lake and adjacent to the eastern edge of the Rathdrum Prairie.

Acreage by Section

64-M333A	6,316

LTA Setting and General Characteristics

Differentiating characteristics: This map unit consists of a plateau, and escarpments at low elevations. Parent materials are surface volcanic ash overlying poorly to moderately weathered Columbia River basalt.

Accessory Characteristics: The primary soils are moderately deep, stony loams and stony silt loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 79 centimeters (25 to 30 inches). The elevation range of this unit is 701 to 914 meters (2300 to 3000 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is moderately dissected by streams with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of a plateau and associated escarpments.

The plateau and escarpments are formed in mixed volcanic ash influenced loess overlying residuum and colluvium of basalt. Slope gradients range from 15 to 50 percent and the steeper escarpment walls range from 50 to 65+ percent. Soils on these landforms are generally moderately deep, weakly to moderately weathered, and medium textured. These soils are classified as Typic Udivitrands and Typic Xerochrepts. The dominant potential natural vegetation is grand fir and Douglas-fir on the well drained sites. Grand fir will occur in the draws and on some north aspects with deeper soils.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA66-M333A
LTA66-M333D

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located adjacent to Lake Pend Oreille in the Coeur d'Alene Mountains on the Idaho Panhandle National Forests.

Acreage by Section

66-M333A	512
66-M333D	594

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are Mazama volcanic ash over weakly weathered limestone bedrock associated with the Cambrian aged Lakeview Formation. Small areas of Rennie shale and Gold Creek quartzite occur with the Lakeview limestone.

Accessory Characteristics: The primary soils are moderately deep to deep. They have silt loam surface soils overlying gravelly and cobbly loamy subsoils. The vegetation is a coniferous forest. Mean annual precipitation ranges from 75 to 88 centimeters (30 to 35 inches). The elevation range of this LTA is 616 to 1280 meters (2000 to 4200 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in limestone bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are moderately deep to deep, and well drained. They have a silt loam or loam surface layer underlain by very gravelly to very cobbly sandy loam and loam subsurface layers. These soils are classified as Andic Dystrochrepts and Typic Udivitrands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, grand fir, western redcedar and western hemlock series. This component represents 100 percent of this LTA.

Compiled by: Gary Ford, Regional Office

LTA72-M333A
LTA72-M333B
LTA72-M333D

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: These units occur in the Selkirk, Purcell and Cabinet Mountains of the Priest, Kootenai, Pack River and Clark Fork River basins of northeast Idaho and northwest Montana. This unit is also located in the St. Joe Mountains of the Bitterroot Range, which is part of the St. Joe and Little North Fork of the Clearwater River basins of northern Idaho.

Acreage by Section

72-M333A	4,337
72-M333B	968
72-M333D	17,671

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a high elevation, gentle to moderately steep sloping, mountain sideslope and ridge landscape setting, which is typically composed of weakly to non dissected mountain slopes, and associated ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly weathered granitics from Cretaceous Kaniksu Batholith and Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to deep sands, sandy loams and loams, with up to 30 percent rock outcrop and scree on some units. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 114 to 178 centimeters (45 to 70 inches). The elevation range of this unit is 1433 to 1981 meters (4700 to 6500 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is weakly to non-dissected by streams, with the dominant stream pattern being parallel when they occur.

LTA Components: This landtype association consists of weakly to non-dissected mountain slopes and associated ridges,

Weakly to non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to deep, weakly weathered and coarse to medium textured. The major soils are classified as Vitric Haplocryands and Andic Cryochrepts. These soils make up the majority of the unit and occur on the well drained sites. Vitric Fulvicryands and Andic Cryumbrepts occur in the poorly drained sites. The shallow soils are classified as Lithic Haplocryands and Lithic Cryochrepts. The dominant potential natural vegetation series over most of the area is subalpine fir, but mountain hemlock is dominant in the St. Joe and Little North Fork of the Clearwater River basins. Minor Douglas-fir occurs on the very dry sites.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

CHAPTER 12

LTA Descriptions

Section M333B Flathead Valley

This Section occurs in northwest Montana and northern Idaho. It includes a portion of the Continental Glaciated Mountains major geomorphic setting previously described. Seventeen LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreages. Map unit descriptions are preceded by the following illustrations:

Figure 50: Map showing location of M333B within the Northern Region

Figure 51: M333B landscape photograph
Ashley Lake and Salish Mountains, Flathead National Forest

Figure 52: Map showing distribution of LTAS within M333B

Figure 53: Bar chart showing abundance of landform groups within M333B

Figure 54: Bar chart showing abundance of geologic material groups within M333B

LTA10-M333B
LTA10-M333C
LTA10-M333D

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the inter-mountain valleys of the Flathead, Clark Fork, and Kootenai River basins of northwest Montana.

Acreage by Section

10-M333B	191,377
10-M333C	63,658
10-M333D	160,219

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting, which is composed of stream terraces, floodplains, and alluvial basins. Parent materials are unstratified to stratified deposits of sands, silts, and/or gravels underlain primarily by Proterozoic metasediments, Cenozoic siltstones, and/or glacial deposits.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse to medium textures. The vegetation is a mosaic of deciduous forest, coniferous forest, and wet meadow/shrubland. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range of this LTA is 758 to 1,970 meters (2500 to 6500 feet). The dominant slopes have gradients of 3 to 15 percent. This LTA is moderately dissected by streams with the dominant stream pattern being dendritic. Wetlands and river over-flow channels are a major component of this LTA.

LTA Components: This landtype association consists of stream terrace, floodplain, and alluvial basin landforms.

Stream terraces are formed in coarse, stratified alluvium. These terraces have slope gradients that range from 0 to 15 percent. Soils on these landforms are deep, poorly developed, and mostly of sand and gravel. The soils vary from moderately well drained to well drained. The major soils on the moderately well-drained sites are Oxyaquic Udifluvents, Typic Ustifluvents, and Typic Udifluvents. The major soils on the well-drained sites are Dystric Eutrochrepts, Andic Dystrichrepts and Typic Xerochrepts. Rock outcrops occur less than 2 percent of the time. The dominant potential natural vegetation series are black cottonwood, Engelmann spruce, western redcedar, grand fir, Douglas-fir, and subalpine fir. This component represents 60 percent of the LTA.

Floodplains and alluvial basins are formed in coarse stratified or unstratified alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, weakly developed and consist mostly of sand, gravel, and silt. These soils vary from moderately well drained to poorly drained. The major soils are classified as Typic Endoaquepts, or Typic and Aeric Endoaquepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series includes subalpine fir, Engelmann spruce, and Drummond's willow. This component represents 40 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest.

LTA11-M333B
LTA11-M333C
LTA11-M333D

VALLEYS: LACUSTRINE SEDIMENTS

Location: This unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

11-M333B	533,326
11-M333C	11,821
11-M333D	111,455

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a valley bottom landscape setting, which is typically composed of glacial lacustrine deposits that have level to slightly undulating topography. Parent materials consist of stratified lake sediments of very fine sands, silts, and clays.

Accessory Characteristics: The primary soils are deep with medium to moderately fine textures. The vegetation ranges from a continuous cover of coniferous vegetation on the well drained sites to wet meadow/shrubland on the poorly drained sites. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range is 758 to 1,818 meters (2500 to 6000 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is slightly dissected by streams. Where present, the dominant stream pattern is dendritic. Wetlands and ponds are a major component of the unit.

LTA Components: This landtype association consists of lacustrine terraces and lacustrine basins.

Lacustrine terraces and lacustrine basins are formed in stratified lake sediments. These landforms have dominant slope gradients ranging from 0 to 25 percent. Included with these landforms are terrace risers/scarps that have slopes that range from 40 to 70 percent. Soils on these landforms are deep, weak to moderately developed with medium and moderately fine textures. In northwestern Montana the major soils on the forested, well-drained sites are classified as Glossic Cryoboralfs or Typic Eutroboralfs, and Eutric Glossoboralfs. In Section M333B additional major soils are Andic/Typic Dystrochrept. The lower elevation, non-forested, valleys the soils are classified as Typic Natrixeralfs and Typic Xerochrept. The dominant potential vegetation series include western redcedar, subalpine fir, grand fir, and Douglas-fir. The major soils on the poorly drained sites are classified as Aeris Epiaquepts and Aquic Eutroboralfs with inclusions of Typic Borosaprists. Rock outcrop occurs on less than 2 percent of this landscape component. Engelmann spruce and Drummond's willow occur on the poorly drained sites.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest

LTA12-M333B
LTA12-M333C
LTA12-M333D

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIAL DEPOSITS

Location: This map unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

12-M333B	428,208
12-M333C	97,651
12-M333D	181,889

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in valley bottom landscape settings, which are typically composed of glacial outwash plains or outwash terraces that have undulating surfaces. Steep escarpments form the front of the some of the terraces. Parent materials consist of either stratified or unstratified glacial fluvial deposits of sand and gravel material. These deposits are typically underlain by glacial moraine deposits or Proterozoic metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse textures. These soils are typically excessively well drained with inclusions of poorly drained soils. The vegetation is primarily coniferous forest with areas of wet meadow/shrubland. Mean annual precipitation ranges from 36 to 140 centimeters (14 to 55 inches). The elevation range of this unit is 758 to 1,667 (2500 to 5500 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is moderate to highly dissected by streams or rivers with the dominant stream pattern being dendritic. Wetlands and riparian areas are important components of this unit.

LTA Components: This landtype association consists of glacial outwash plains and outwash terraces.

These glacial outwash plains and outwash terraces are formed in coarse, stratified or unstratified glacial fluvial sediments. Slope gradients range from 0 to 25 percent with gradients up to 50 percent on the terrace risers. Soils on these landforms are deep, weakly developed with extremely gravelly coarse textures. The major soils are classified as Dystric Eutrochrepts, Typic Dystrichrept, Andic Dystrichrepts, and Andic Ustochrepts. Rock outcrop occurs on less than 5 percent of this map unit. The dominant potential vegetation series include Douglas-fir, western redcedar, subalpine fir, and Engelmann spruce.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen. Kootenai National Forest

LTA14-M333B
LTA14-M333C

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located in the inter-mountain valleys of the Flathead River basin in northwest Montana.

Acreage by Section

14-M333B	33,343
14-M333C	5,120

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting, which is composed of stream terraces, floodplains, and alluvial basins. Parent materials are stratified deposits of fine sands, silts, and clays with or without gravels. These deposits are underlain primarily by Cenozoic siltstones and glacial deposits.

Accessory Characteristics: The primary soils are deep with medium or moderately fine textures. The vegetation is a mosaic of deciduous forest, coniferous savanna, grassland, and wet meadow/shrubland. Mean annual precipitation ranges from 30 to 51 centimeters (12 to 20 inches). The elevation range of this LTA is 745 to 1,067 (2460 to 3500 feet). The dominant slopes have gradients of 0 to 10 percent. This LTA is moderately dissected by streams with the dominant stream pattern being dendritic. Wetlands and river over-flow channels are a major component of this LTA.

LTA Components: This landtype association consists of stream terraces, floodplains, and alluvial basins.

Stream terraces are formed in stratified alluvium. These terraces have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, poorly developed, and coarse to moderately fine textured. These soils are classified as Typic Ustifluvents, Udic Haploborolls, and Typic Eutrochrepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series include ponderosa pine and rough fescue. This component represents 85 percent of the LTA.

Floodplains and alluvial basins are formed in stratified recent alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, weakly developed with medium to moderately fine textures. The major soils are classified as Fluvaquentic Haploxerolls, or Typic and Aeric Endoaquepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series include ponderosa pine, Engelmann spruce, and Geyer willow. This component represents 15 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA20-M333B
LTA20-M333C
LTA20-M333D

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Swan, Mission, Bitterroot, Purcell, Salish, Cabinet, and Flathead mountain ranges of the Clark Fork, Flathead, and Kootenai River basins in northwest Montana.

Acreage by Section

20-M333B	212,411
20-M333C	163,793
20-M333D	1,000,850

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which are typically composed of structural breakland and stream breakland landforms. Parent materials are volcanic ash overlying weakly-weathered, moderately metamorphosed, Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, limestone and dolomites.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, and mountain shrub/grass lands. Mean annual precipitation ranges from 41 to 229 centimeters (16 to 90 inches). The elevation range is 697 to 2,590 (2300 to 8500 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is slightly to moderately dissected by streams with the dominant stream patterns being sub-parallel and parallel. Major streams or rivers are typically located at the base of stream breaks. Lakes and ponds are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with very gravelly medium textures. These soils are classified as Lithic, Typic and Andic Dystrochrepts, and Lithic, Typic, and Andic Cryochrepts on colder sites. Rock outcrop and talus occur on 20 to 80 percent of this landscape component. The dominant potential natural vegetation series on the warmer sites is Douglas-fir. On the cooler sites it is subalpine fir, or whitebark pine-subalpine fir. This component represents 80 percent of this unit.

Stream breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic and Typic Dystrochrepts on the warmer sites; and Lithic, Typic and Andic Cryochrepts on the cooler sites. Rock outcrop and talus occur on 20 to 60 percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir on the warmer sites and subalpine fir on the cooler sites. This component represents 20 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest.

LTA40-M333B
LTA40-M333C
LTA40-M333D

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This map unit is located in the Bitterroot, Cabinet, Purcell, Salish, Swan, Mission, Flathead, and Whitefish Mountain ranges of the Clark Fork, Flathead and Kootenai basins in northwest Montana.

Acreage by Section

40-M333B	221,169
40-M333C	1,637,034
40-M333D	222,209

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in an upland and alpine landscape settings, which are primarily composed of glacial troughwall, cirque headwall, and cirque basin landforms. Parent materials are alpine glacial debris and colluvium derived from and underlain by moderately metamorphosed, Proterozoic metasediments composed of argillite, siltite, quartzite, limestone and dolomite bedrocks. Inclusions of other bedrocks such as granite occur in this map unit.

Accessory Characteristics: The primary soils are shallow to moderately deep, with cobbly or gravelly medium textures. The vegetation is a mosaic of coniferous forest, alpine meadows, and shrubland associated with avalanche chutes. Mean annual precipitation ranges from 102 to 305 centimeters (40 to 120 inches). The elevation range of this unit is 1,212 to 3,182 meters (4000 to 10,500 feet). The dominant slopes range from 50 to 90 percent. The cirque basin portion of the map unit has slopes that range from 5 to 40 percent. The troughwall landforms are moderately to highly dissected by streams with the dominant stream pattern being parallel. The cirque headwall and cirque basin landforms are weakly dissected by streams with the dominant stream pattern being parallel. Wetlands are associated with the cirque basins, and occur as a minor component of this unit.

LTA Components: This landtype association consists primarily of glacial troughwalls, cirque headwalls, and cirque basins.

Glacial troughwalls are formed in glacial tills on the lower elevation slopes with volcanic ash influenced colluvium on the higher elevation slopes. Slope gradients range from 50 to 90 percent. Soils on the lower slopes of this landform are moderately shallow to deep and are moderate to highly developed, with cobbly medium textures. The major soils on the lower slopes are classified as Andeptic and Typic Cryoboralfs. Soils on the upper slopes of this landform are shallow to moderately deep, are moderately developed, and have gravelly medium textures. The major soils on the higher slopes are Andic, Typic, and Lithic Cryochrepts. Rock outcrops occupy up to 15 percent of the area. The dominant potential natural vegetation series are grand fir, western redcedar, Douglas-fir, and subalpine fir on the lower slopes; and subalpine fir and mountain hemlock on the upper slopes. This component represents 55 percent of the LTA.

Cirque headwalls/cirque basins are formed in glacial till on the lower elevation slopes and volcanic ash influenced colluvium on the higher elevation slopes. Included in this alpine landscape setting are small areas of alpine ridge landforms. Slope gradients range from 5 to 90 percent. Soils on these landforms are shallow to moderately deep and weakly developed, with very

gravelly medium textures. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. Rock outcrops occupy more than 40 percent of the area. The dominant potential natural vegetation series include subalpine fir, and whitebark pine-subalpine fir. This component represents 45 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest

LTA47-M333B

ALPINE TROUGHS AND TROUGHWALLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Purcell and Cabinet Mountains of the Kootenai, Pack River and Clarkfork River basins of northeast Idaho and northwest Montana.

Acreage by Section

47-M333B 27,452

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at the higher elevations, in a gentle to steep alpine glacial setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are surface volcanic ash overlying weakly weathered tills consisting of quartzites, siltites and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep sandy loams and loams, with inclusions of rock outcrop, scree and avalanche chutes. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 127 to 229 centimeters (50 to 90 inches). The elevation range of this unit is 1372 to 2286 meters (4500 to 7500 feet). The dominant slopes range from 1 percent in the trough bottoms to 85 percent on the steeper troughwalls. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel. Wet sidehill areas and grassy parks are a component of this LTA.

LTA Components: This landtype association consists of glacial troughwalls and glacial trough bottoms.

These moderately steep to steep glaciated troughwalls consist of glacial till from metasedimentary bedrock sources. The slope gradients range from 40 to 85 percent. Soils on these landforms are shallow to deep, weakly weathered and medium textured. The major soils on the well drained sites are classified as Vitric Haplocryands and Typic Cryochrepts. Lithic Cryochrepts are scattered throughout. Vitric Fulvicryands and Aquic Cryochrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in this unit. The dominant potential natural vegetation is the subalpine fir series. This component represents about 70 percent of this unit.

The trough bottoms consist of deep glacial tills and glacio-fluvial materials from metasedimentary bedrock sources. The slope gradients range from 1 to 40 percent. Soils on these landforms are moderately deep to deep, weakly weathered and medium textured. The major soils on the well drained sites are classified as Vitric Haplocryands and Typic Cryochrepts. Vitric Fulvicryands and Aquic Cryochrepts occur in depressional area and other poorly drained sites. The dominant potential natural vegetation is the subalpine fir series. This component represents about 30 percent of this unit.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA50-M333B

LTA50-M333D

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This map unit is located primarily in the Flathead, Clark Fork and Kootenai River basins of the Salish, Purcell, Bitterroot, and Cabinet Mountains of northwest Montana.

Acreage by Section

50-M333B	2,681,456
50-M333D	66,747

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley and upland settings mainly within a continentally glaciated landscape. Parent materials are continental and/or alpine glacial debris underlain by Proterozoic metasediments composed of argillites, siltites, limestones, and quartzites.

Accessory Characteristics: The primary soils are moderately shallow to very deep, very gravelly coarse silt and fine sandy loams. The major vegetative cover is a dense coniferous forest with occasional grassy openings. Mean annual precipitation ranges from 36 to 178 centimeters (14 to 70 inches). The elevation range is 667 to 1667 meters (2200 to 5500 feet). The dominant slopes range from 20 to 50 percent. This map unit is slightly to moderately dissected by streams with the dominant stream pattern being dendritic. Bogs are a minor component of this map unit.

LTA Components: This landtype association has the classic subdued glacial landforms which are comprised of convex, scoured ridges and sideslopes, and valleys with deeper soils.

The straight side slopes and valleys are composed of a rounded ridges and filled in valleys landform. These areas have slopes that range from 5 to 60 percent. The ridges were strongly scoured and then covered by glacial debris. The drainage bottoms were filled in. The landforms (straight mountain slopes and concave lower side slopes) have soils that are moderately deep to very deep consisting of rock, fine sand and coarse silt. The major soils are classified as Andic Dystrochrepts, Typic Dystrochrepts, Typic Eutrochrepts, Typic Ustochrepts, Dystric Cryochrepts, and Andic Dystric Eutrochrept. Rock outcrops occupy less than 15 percent of the area. This landform is covered with a dense forest cover. The dominant potential natural vegetation series include western redcedar, western hemlock, subalpine fir, and Douglas-fir. This component represents 65 percent of the unit.

The ridge top landform is comprised of the convex feature of the landscape. The soils on this part of the landscape are moderately shallow to shallow. The major soils are classified as Lithic, Typic, and Andic Cryochrepts. The dominant potential natural vegetation series is subalpine fir. This component represents 35 percent of the map unit.

Compiled by: Louis Kuennen, Kootenai National Forest and Skip Barndt, Lolo National Forest.

LTA51-M333B

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Purcell and Cabinet Mountains of the Kootenai and Pack River Basins of northeast Idaho.

Acreage by Section

51-M333B 90,791

LTA Unit Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a gentle to moderately steep valley bottom, mountain sideslope and ridge landscape setting at elevations that range from low to high. The unit is typically composed of dissected and non dissected mountain slopes, valleys and ridges comprised of alpine and continental till. Parent materials are surface volcanic ash overlying substratum materials of glacial tills derived from Cretaceous Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are shallow to deep sands, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 127 centimeters (25 to 50 inches). The elevation range of this unit is 731 to 1737 meters (2400 to 5700 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected, continentally glaciated, convex ridges and concave valleys.

The glaciated convex ridges and mountain sideslopes were strongly scoured and then covered by varying thickness of glacial tills. The slope gradients range from near level to 60 percent. The drainage bottoms and toeslopes consist of deep glacial tills and glacio-fluvial materials. The slope gradients range from 0 to 40 percent. Soils on the ridge and mountain sideslopes landforms are shallow to deep, weakly weathered, and sandy textured. Soils in the drainage bottoms and toeslopes are deep, weakly weathered, and sandy textured. The major soils on the well drained sites are classified as Andic Cryochrepts and Andic Dystrochrepts, with Andic Xerochrepts on the drier sites. The areas with deeper ash caps are Vitric Haplocryands and Typic Udivitrands. Andic Cryumbrepts-Andic Haplumbrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in the scoured ridge and mountain sideslope landforms. The dominant potential natural vegetation series on the well drained, high elevation sites is subalpine fir with western hemlock, western red cedar and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation series on the poorly drained sites are subalpine fir at the higher elevations and in cold air pockets at lower elevations, and western red cedar at the mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forest

LTA53-M333B
LTA53-M333C
LTA53-M332B

GLACIATED MOUNTAIN SLOPES: SANDSTONES, SHALES, AND CARBONATES

Location: This map unit is located in of the Swan, Mission, Flathead, and Whitefish mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

53-M333B	8,091
53-M333C	100,613
53-M332B	6,924

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley bottom and upland landscape settings, which are primarily composed of glacial moraine landforms. Parent materials are continental or alpine glacial debris with or without volcanic ash surface layers; underlain by Paleozoic and Mesozoic sandstone, shale, and limestone bedrocks. In the North Fork of the Flathead River areas of Tertiary siltstone are included in this map unit.

Accessory Characteristics: The primary soils are moderately deep to very deep, with gravelly medium and moderately fine textures. The major vegetative cover is a dense coniferous forest with occasional meadow openings. Mean annual precipitation ranges from 51 to 178 centimeters (20 to 70 inches). The elevation range is 1,036 to 2,316 (3400 to 7600 feet). The dominant slopes range from 5 to 50 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists primarily of glacial moraines. Glacially scoured ridge top landforms occur as a minor component.

On the valley bottom landscape setting the glacial moraines occur on rolling hummocky topography, with slopes that range from 5 to 30 percent slope. On the upland landscape setting the glacial moraines occur on straight to slightly concave slopes, with range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toe-slope associated with glacial troughwalls. Soils on these landforms are moderately deep to very deep, and are moderate to highly developed, with gravelly moderately-fine or fine textures. The major soils are classified as Typic Eutrochrepts and Andeptic Cryoboralfs. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir. A minor component of this map unit is glacially scoured ridge tops. Slope gradients range from 5 to 20 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with gravelly medium textures. The major soils are classified as Andic Cryochrepts. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is subalpine fir and Douglas-fir. This component represents 15 percent of this map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA58-M333B
LTA58-M333C

GLACIATED MOUNTAIN SLOPES: HIGHLY WEATHERED METASEDIMENTARY TILL

Location: This map unit is located in the Whitefish, Mission, Swan, Purcell, Salish, Cabinet, and Flathead mountain ranges of the Flathead, Kootenai, and Swan River basins in northwest Montana.

Acreage by Section

58-M333B	164,491
58-M333C	20,031

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both upland and valley bottom landscape settings, which are typically composed of glacial moraine landforms. Parent materials are alpine or continental glacial debris deposited during Pre-Wisconsin glacial periods. These deposits are underlain by moderately metamorphosed, Proterozoic metasedimentary bedrock composed of argillites, siltites, dolomites, limestones, and quartzites; or Tertiary siltstones.

Accessory Characteristics: The primary soils are moderately deep to very deep very gravelly coarse silt/fine sandy loams. The major vegetative cover is a dense coniferous forest with occasional grassy openings. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range of this LTA is 667 to 1,707 meters (2200 to 5600 feet). The dominant slopes range from 20 to 50 percent. This map unit is moderately to highly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists primarily of glacial moraines.

The landscape setting for this map unit varies from a valley bottom to a moderately steep upland setting. In the valley bottom landscape setting the glacial moraines occur on rolling, hummocky topography, with slopes that range from 5 to 30 percent slope. In the upland landscape setting the glacial moraines occur on straight to slightly concave slopes that range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toeslope associated with glacial troughwalls.

Soils on these landforms are moderately deep to very deep and are moderate to highly developed with gravelly moderately-fine or fine textures. The major soils are classified as Typic Glossoboralfs, Typic Eutrobtoralfs, and Andeptic Cryoboralfs. Rock outcrops occupy less than 5 percent of the area. The dominant potential natural vegetation series include western redcedar, grand fir, subalpine fir and Douglas-fir.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest

LTA60-M333B
LTA60-M333C

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Swan, Purcell, Cabinet, Salish, Mission, and Flathead Mountain ranges of the Flathead, Kootenai, and Swan River basin in northwest Montana.

Acreage by Section

60-M333B	497,972
60-M333C	114,155

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which are typically composed of dissected mountain slope, glaciated mountain slope, and glacially scoured ridge top landforms. The geomorphic processes that occur on these areas include: colluvial, fluvial and glacial, erosion or deposition. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, and limestones.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, mountain shrublands, and mountain grasslands. Mean annual precipitation ranges from 46 to 203 centimeters (18 to 80 inches). The elevation range is 758 to 2,286 meters (2500 to 7500 feet). The dominant slopes have gradients of 15 to 50 percent. This unit is moderate to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately deep and weak to moderately developed with medium textures. The major soils are classified as Lithic, Andic or Typic Cryochrepts, and Typic and Lithic Dystrochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation series includes subalpine fir, subalpine fir-whitebark pine, and Douglas-fir. This landform component makes up 50 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering-in-place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, with weak to moderate development, and gravelly medium textures. The major soils are classified as Andic Cryochrepts, Andeptic and Typic Cryoboralfs, and Typic or Argic Cryoborolls, Typic Haploborolls and Typic Dystrochrept. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation series includes Douglas-fir and subalpine fir. This landform component represents 50 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest

LTA64-M333B

MOUNTAIN SLOPES AND RIDGES: VOLCANIC

Location: This LTA is located primarily in the Salish Mountain Range of the Flathead River Basin in northwest Montana.

Acreage by Section

64-M333B	19,044

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in an upland landscape setting which is typically composed of dissected mountain slope, glaciated mountain slope, and glacially scoured ridge top landforms. Parent materials are Tertiary volcanic bedrock composed of welded tuff or basalt. This unit has inclusions of Tertiary intrusive bedrock composed on granodiorite or granite. The soil material is weathering in place.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium and moderately coarse textures. The vegetation is a mosaic of coniferous forest and mountain grasslands. Mean annual precipitation ranges from 41 to 102 centimeters (16 to 40 inches). The elevation range is 853 to 1,584 meters (2800 to 5200 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is moderately to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately shallow, are weakly to moderately developed, and have medium and moderately fine textures. The major soils are classified as Lithic Cryochrepts, and Typic and Lithic Haploxerolls. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation series include subalpine fir, rough fescue, and Douglas-fir. This landform component makes up 40 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering in place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, with moderate to high development, and have gravelly to very gravelly medium textures. The major soils are classified as Typic Argixeroll, Glossic Eutroboralfs, and Typic Ustochrepts. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation series includes Douglas-fir and subalpine fir. This landform component represents 60 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA68-M333B
LTA68-M333C
LTA68-M333D

MOUNTAIN SLOPES AND RIDGES: SANDSTONES, SHALES AND CARBONATES

Location: This unit is located in the Whitefish, Swan, and Flathead mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

68-M333B	8,043
68-M333C	36,067
68-M333D	1,511

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both upland and alpine landscape settings, which are typically composed of dissected mountain slopes, glaciated mountain slopes, and glacially scoured ridge top landforms. Colluvial, fluvial and glacial, erosional/depositional geomorphic processes occur in these areas. Parent materials are volcanic ash overlying weakly weathered Paleozoic and Mesozoic sandstone, shale, and limestone bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium and moderately fine textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grassland. Mean annual precipitation ranges from 51 to 177 centimeters (20 to 70 inches). The elevation range is 1,219 to 2,134 meters (4000 to 7000 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is moderate to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately deep, weak to moderately developed with medium and moderately fine textures. The major soils are classified as Lithic Andic, or Typic Cryochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir-whitebark pine, and subalpine fir. This landform component makes up 40 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering-in-place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, weak to moderate development, with medium and moderately fine textures. The major soils are classified as Andic Cryochrepts, Andeptic and Typic Cryoboralfs, and Typic or Argic Cryoborolls. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This landform component represents 60 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA70-M333B
LTA70-M333C
LTA70-M333D

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Cabinets, Purcell, Salish, Bitterroot, Swan, Mission, and Flathead Mountain ranges of the Clark Fork, Pack River, Kootenai, and Flathead River basins in northwest Montana and north Idaho.

Acreage by Section

70-M333B	153,508
70-M333C	60,686
70-M333D	518,308

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in an alpine landscape setting and is typically composed of a ridge top landform which has formed by frost shattering. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed, Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, dolomites, and limestones. There are inclusions of other types of bedrock such as granite in this map unit.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grasslands. Mean annual precipitation ranges from 102 to 279 centimeters (40 to 110 inches). The elevation range is 1,341 to 2,758 (4400 to 9100 feet). The dominant slopes have gradients of 20 to 60 percent. This map unit is undivided to slightly dissected by streams, with the pattern being dendritic or parallel where present.

LTA Components: This landtype association consists of glacially scoured, frost shattered ridge tops.

Glacially scoured, frost shattered ridge tops have been strongly modified by continental ice, alpine ice, and frost action. The prominent features are ridge tops that have been rounded or scoured by the previously mentioned actions. Exposed bedrock comprises 10 to 40 percent of the area. These areas have slopes that range from 5 to 70 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. The major soils are classified as Lithic Cryochrepts, Lithic Haplocryands, Vitric Haplocryands, and Andic Cryochrepts. Vitric Fulvicryands and Andic Cryumbrepts occur in the poorly drained sites. The dominant potential natural vegetation includes subalpine fir, mountain hemlock, and whitebark pine-subalpine fir series. This landform component makes up 90 percent of the map unit. There are up to 10 percent inclusions of nivation hollows that occur in this map unit.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest, Jerry Niehoff, Idaho Panhandle National Forests

LTA72-M333B
LTA72-M333A
LTA72-M333D

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Selkirk, Purcell and Cabinet Mountains of the Priest, Kootenai, Pack River and Clark Fork River basins of northeast Idaho and northwest Montana. This unit is also located in the St. Joe Mountains of the Bitterroot Range, which is part of the St. Joe and Little North Fork of the Clearwater River basins of northern Idaho.

Acreage by Section

72-M333A	4,337
72-M333B	967
72-M333D	17,671

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a high elevation, gentle to moderately steep sloping, mountain sideslope and ridge landscape setting, which is typically composed of weakly to non dissected mountain slopes, and associated ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly weathered granitics from Cretaceous Kaniksu Batholith and Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to deep sands, sandy loams and loams, with up to 30 percent rock outcrop and scree on some units. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 114 to 178 centimeters (45 to 70 inches). The elevation range of this unit is 1433 to 1981 meters (4700 to 6500 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is weakly to non-dissected by streams, with the dominant stream pattern being parallel when they occur.

LTA Components: This landtype association consists of weakly to non-dissected mountain slopes and associated ridges,

Weakly to non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to deep, weakly weathered and coarse to medium textured. The major soils are classified as Vitric Haplocryands and Andic Cryochrepts. These soils make up the majority of the unit and occur on the well drained sites. Vitric Fulvicryands and Andic Cryumbrepts occur in the poorly drained sites. The shallow soils are classified as Lithic Haplocryands and Lithic Cryochrepts. The dominant potential natural vegetation series over most of the area is subalpine fir, but mountain hemlock is dominant in the St. Joe and Little North Fork of the Clearwater River basins. Minor Douglas-fir occurs on the very dry sites.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA90-M333B
LTA90-M333C

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in the Swan, Salish, Flathead, Mission, and Whitefish Mountain ranges of the Swan and Flathead River basins in northwest Montana.

Acreage by Section

90-M333B	1,358
90-M333C	58,472

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both upland and alpine landscape settings. Typically landslide areas are associated with structural breakland, stream breakland, glacial troughwall, and glacial moraine landforms. Parent materials are typically glacial tills underlain by Paleozoic and Mesozoic sandstone and shale bedrock; or Proterozoic argillite, siltite, quartzite, dolomite and limestone.

Accessory Characteristics: The primary soils are moderately deep to deep with gravelly medium to moderately fine textures. The vegetation is primarily coniferous forest with inclusions of shrublands. Mean annual precipitation ranges from 51 to 229 centimeters (20 to 90 inches). The elevation range is 914 to 2,316 meters (3000 to 7600 feet). The dominant slopes have gradients of 20 to 60 percent. This unit is slightly to moderately dissected by streams with the dominant stream pattern being deranged. Wetlands and small ponds are a major component of this unit.

LTA Components: This landtype association consists of surficial landslides and bedrock landslides.

Surficial landslide deposits are formed in glacial till and colluvium parent materials. Slope gradients range from 20 to 50 percent. Soils on these landforms are moderately deep to deep and moderately developed with gravelly medium textures. These soils are classified as Typic and Andeptic Cryoboralfs and Typic Eutroboralfs. Rock outcrop occurs on less than 10 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir and western red cedar series. This component represents 60 percent of this unit.

Bedrock landslide landforms are formed in residual and colluvial parent materials derived from native bedrock formations. Slope gradients range from 30 to 50 percent. Soils on these landforms are shallow to deep and moderately developed with gravelly medium and moderately fine textures. These soils are classified as Typic and Andeptic Cryoboralfs, Typic Eutroboralfs, and Andic Cryochrept. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir, Douglas-fir, and western red cedar series. This component represents 40 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest

CHAPTER 13

LTA Descriptions

Section M333C Northern Rockies

This Section occurs in northwest Montana. It generally coincides with the Alpine Glaciated Metasedimentary Mountains geomorphic area previously described. Nineteen LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreage. Map unit descriptions are preceded by the following illustrations:

Figure 55: Map showing location of M333C within the Northern Region

Figure 56: M333C landscape photograph, Mission Range and Mission Valley Flathead National Forest

Figure 57: Map showing distribution of LTAS within M333C

Figure 58: Bar chart showing abundance of landform groups within M333C

Figure 59: Bar chart showing abundance of geologic material groups within M333C

LTA10-M333C
LTA10-M333B
LTA10-M333D

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the inter-mountain valleys of the Flathead, Clark Fork, and Kootenai River basins of northwest Montana.

Acreage by Section

10-M333C	63,658
10-M333B	191,377
10-M333D	160,219

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting, which is composed of stream terraces, floodplains, and alluvial basins. Parent materials are unstratified to stratified deposits of sands, silts, and/or gravels underlain primarily by Proterozoic metasediments, Cenozoic siltstones, and/or glacial deposits.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse to medium textures. The vegetation is a mosaic of deciduous forest, coniferous forest, and wet meadow/shrubland. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range is 758 to 1,970 meters (2500 to 6500 feet). The dominant slopes have gradients of 3 to 15 percent. This LTA is moderately dissected by streams with the dominant stream pattern being dendritic. Wetlands and river over-flow channels are a major component of this LTA.

LTA Components: This landtype association consists of stream terraces, floodplains, and alluvial basins.

Stream terraces are formed in coarse, stratified alluvium. These terraces have slope gradients that range from 0 to 15 percent. Soils on these landforms are deep, poorly developed, and mostly of sand and gravel. The soils vary from moderately well drained to well drained. The major soils on the moderately well-drained sites are Oxyaquic Udifluvents, Typic Ustifluvents, and Typic Udifluvents on the well drained sites. The major soils on the well drained sites are Dystric Eutrochrepts, Andic Dystrichrepts, and Typic Xerochrepts. Rock outcrops occur less than 2 percent of the time. The dominant potential natural vegetation series are black cottonwood, Engelmann spruce, western redcedar, grand fir, and Douglas-fir. This component represents 60 percent of the LTA.

Floodplains and alluvial basins are formed in coarse stratified or unstratified alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, weakly developed and consist mostly of sand, gravel, and silt. These soils vary from moderately well drained to poorly drained. The major soils are classified as Typic Endoaquents, or Typic and Aeric Endoaquepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series are subalpine fir, Engelmann spruce and Drummond's willow. This component represents 40 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest

LTA11-M333C
LTA11-M333B
LTA11-M333D

VALLEYS: LACUSTRINE SEDIMENTS

Location: This unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

11-M333C	11,821
11-M333B	533,326
11-M333D	111,455

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a valley bottom landscape setting, which is typically composed of glacial lacustrine deposits that have level to slightly undulating topography. Parent materials consist of stratified lake sediments of very fine sands, silts, and clays.

Accessory Characteristics: The primary soils are deep with medium to moderately fine textures. The vegetation ranges from a continuous cover of coniferous vegetation on the well drained sites to wet meadow/shrubland on the poorly drained sites. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range is 758 to 1,818 meters (2500 to 6000 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is slightly dissected by streams. Where present, the dominant stream pattern is dendritic. Wetlands and ponds are a major component of the unit.

LTA Components: This landtype association consists of lacustrine terraces and lacustrine basins.

Lacustrine terraces and lacustrine basins are formed in stratified lake sediments. These landforms have dominant slope gradients ranging from 0 to 25 percent. Included with these landforms are terrace risers/scarps that have slopes that range from 40 to 70 percent. Soils on these landforms are deep, weak to moderately developed with medium and moderately fine textures. In northwestern Montana the major soils on the forested, well-drained sites are classified as Glossic Cryoboralfs, Typic Eutroboralfs, and Eutric Glossoboralfs fine, mixed, frigid. In Section M333B additional major soils are Andic and Typic Dystrochrepts. The lower elevation, non-forested valleys the soils are classified as Typic Natrixeralfs and Typic Xerochrepts. The dominant vegetation is western redcedar, subalpine fir, grand fir and Douglas-fir.

The major soils on the poorly drained sites are classified as Aerice Epiaquepts and Aquic Eutroboralfs with inclusions of Typic Borosaprists. Rock outcrop occurs on less than 2 percent of this landscape component. The dominant potential natural vegetation series on the poorly drained sites are Engelmann spruce, Drummond's willow and beaked sedge.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest.

LTA12-M333C
LTA12-M333B
LTA12-M333D

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIAL DEPOSITS

Location: This map unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

12-M333C	97,651
12-M333B	428,208
12-M333D	181,889

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in valley bottom landscape settings, which are typically composed of glacial outwash plains or outwash terraces that have undulating surfaces. Steep escarpments form the front of the some of the terraces. Parent materials consist of either stratified or unstratified glacial fluvial deposits of sand and gravel material. These deposits are typically underlain by glacial moraine deposits or Proterozoic metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse textures. These soils are typically excessively well drained with inclusions of poorly drained soils. The vegetation is primarily coniferous forest with areas of wet meadow/shrubland. Mean annual precipitation ranges from 36 to 140 centimeters (14 to 55 inches). The elevation range is 758 to 1,667 meters (2500 to 5500 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is moderate to highly dissected by streams or rivers with the dominant stream pattern being dendritic. Wetlands and riparian areas are important components of this unit.

LTA Components: This landtype association consists of glacial outwash plains and outwash terraces.

These glacial outwash plains and outwash terraces are formed in coarse, stratified or unstratified glacial fluvial sediments. Slope gradients range from 0 to 25 percent with gradients up to 50 percent on the terrace risers. Soils on these landforms are deep, weakly developed with extremely gravelly coarse textures. The major soils are classified as Dystric Eutrochrepts, Typic Dystrichrept, Andic Dystrichrepts, and Andic Ustochrepts. Rock outcrop occurs on less than 5 percent of this map unit. The dominant potential natural vegetation is Douglas-fir, western redcedar, subalpine fir and spruce.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen. Kootenai National Forest.

LTA14-M333C
LTA14-M333B

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located in the inter-mountain valleys of the Flathead River basin in northwest Montana.

Acreage by Section

14-M333C	5,120
14-M333B	33,343

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting, which is composed of stream terraces, floodplains, and alluvial basins. Parent materials are stratified deposits of fine sands, silts, and clays with or without gravels. These deposits are underlain primarily by Cenozoic siltstones and glacial deposits.

Accessory Characteristics: The primary soils are deep with medium or moderately fine textures. The vegetation is a mosaic of deciduous forest, coniferous savannah, grassland, and wet meadow/shrubland. Mean annual precipitation ranges from 30 to 51 centimeters (12 to 20 inches). The elevation range of this LTA is 745 to 1,067 (2460 to 3500 feet). The dominant slopes have gradients of 0 to 10 percent. This LTA is moderately dissected by streams with the dominant stream pattern being dendritic. Wetlands and river over-flow channels are a major component of this LTA.

LTA Components: This landtype association consists of stream terraces, floodplains, and alluvial basins.

Stream terraces are formed in stratified alluvium. These terraces have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, poorly developed, and coarse to moderately-fine textured. These soils are classified as Typic Ustifluvents, Udic Haploborolls, and Typic Eutrochrepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series include ponderosa pine and rough fescue. This component represents 85 percent of the LTA.

Floodplains and alluvial basins are formed in stratified recent alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, weakly developed with medium to moderately-fine textures. The major soils are classified as Fluvaquent Haploxerolls, or Typic and Aeric Endoaquepts. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation series include ponderosa pine, Engelmann spruce, and Geyer willow. This component represents 15 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA20-M333C
LTA20-M333B
LTA20-M333D

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Swan, Mission, Bitterroot, Purcell, Salish, Cabinet, and Flathead mountain ranges of the Clark Fork, Flathead, and Kootenai River basins in northwest Montana.

Acreage by Section

20-M333C	163,793
20-M333B	212,411
20-M333D	1,000,850

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which is typically composed of structural breakland and stream breakland landforms. Parent materials are volcanic ash overlying weakly-weathered, moderately metamorphosed, Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, limestones and dolomites.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, and mountain shrub/grass lands. Mean annual precipitation ranges from 41 to 229 centimeters (16 to 90 inches). The elevation range is 697 to 2,590 meters (2300 to 8500 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is slightly to moderately dissected by streams with the dominant stream patterns being sub-parallel and parallel. Major streams or rivers are typically located at the base of stream breaks. Lakes and ponds are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with very gravelly medium textures. These soils are classified as Lithic, Typic and Andic Dystrochrepts on warm sites; and Lithic, Typic, and Andic Cryochrepts on colder sites. Rock outcrop and talus occur on 20 to 80 percent of this landscape component. The dominant potential natural vegetation on the warmer sites are Douglas-fir; and on the cooler sites are subalpine fir, and whitebark pine-subalpine fir. This component represents 80 percent of this unit.

Stream breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic and Typic Dystrochrepts on the warmer sites; and Lithic, Typic and Andic Cryochrepts on the cooler sites. Rock outcrop and talus occur on 20 to 60 percent of this landscape component. The dominant potential natural vegetation on the warmer sites is Douglas-fir; and on the cooler sites subalpine fir. This component represents 20 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest.

LTA25-M333C

BREAKS: SANDSTONES, SHALES AND LIMESTONES

Location: This unit is located in the Whitefish, Swan, and Flathead mountain ranges of the Flathead River basin in northwest Montana.

Acreage by Section

25-M333C	10,321

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both upland and alpine landscape settings, which are typically composed of structural breaks and stream breaks. Parent materials are volcanic ash overlying weakly weathered Paleozoic and Mesozoic sandstone, shale, and limestone bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep, with very gravelly medium and moderately fine textures. The vegetation is a mosaic of coniferous forest, shrubland and mountain grasslands. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range is 915 to 2,134 meters (3000 to 7000 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is slightly to moderately dissected by streams, with the dominant stream patterns being sub-parallel and parallel. Major streams or rivers are typically located at the base of the stream breaks. Lakes and ponds are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered sandstone, shale, and limestone, with a surface layer of volcanic ash. Slope gradients range from 50 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with gravelly medium and moderately-fine textures. These soils are classified as Lithic, Typic and Andic Cryochrepts. Rock outcrop occurs on between 20 to 80 percent of this landscape component. The dominant potential natural vegetation at lower elevations is Douglas-fir; and at higher elevations subalpine fir, and whitebark pine-subalpine fir. This component represents 80 percent of this unit.

Stream breaks are formed in colluvial materials from weakly weathered sandstone, shale, and limestone. Slope gradients range from 50 to 90 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with very gravelly medium textures. These soils are classified as Lithic, Typic and Andic Cryorthents. Rock outcrop occurs on 20 percent of this landscape component. The dominant potential natural vegetation at lower elevations is Douglas-fir with subalpine fir at the higher elevations. This component represents 20 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA27-M333C
LTA27-M332C
LTA27-331D

BREAKS: CARBONATES

Location: This LTA is located mostly in the Rocky Mountain Front in northwest Montana on the Lewis and Clark National Forest.

Acreage by Section

27-M333C	461
27-M332C	97,585
27-331D	148

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of structural breaks. Parent materials are residuum underlain by limestone bedrock.

Accessory Characteristics: The primary soils are shallow and moderately deep with loamy skeletal textures. The vegetation is a mosaic of coniferous forest and rock. Mean annual precipitation ranges from 51 to 54 centimeters (20 to 25 inches). The elevation range of this LTA is 1968 to 2460 meters (6000 to 7500 feet). The dominant slopes have gradients of 60 to 80 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being subparallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of structural breaks.

Structural breaks are formed by thrust faulting along the eastern edge of the overthrust belt, and are most dramatic in limestone bedrock. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed, overlie calcareous, very stoney colluvium, and have loamy skeletal textures. These soils are classified as Lithic and Typic Ustochrepts and Typic Cryochrepts. Rock outcrop occurs on 15 to 50 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. This component represents 100 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA40-M333C
LTA40-M333B
LTA40-M333D

STEEP GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This map unit is located in the Bitterroot, Cabinet, Purcell, Salish, Swan, Mission, Flathead, and Whitefish Mountain ranges of the Clark Fork, Flathead and Kootenai basins in northwest Montana.

Acreage by Section

40-M333C	1,637,034
40-M333B	221,169
40-M333D	222,209

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in an upland and alpine landscape settings, which are primarily composed of glacial troughwall, cirque headwall, and cirque basin landforms. Parent materials are alpine glacial debris and colluvium derived from and underlain by moderately metamorphosed Proterozoic metasediments composed of argillite, siltite, quartzite, limestone, and dolomite bedrocks. Inclusions of other bedrocks such as granite occur in this map unit.

Accessory Characteristics: The primary soils are shallow to moderately deep, with cobbly or gravelly medium textures. The vegetation is a mosaic of coniferous forest, alpine meadows, and shrubland associated with avalanche chutes. Mean annual precipitation ranges from 102 to 305 centimeters (40 to 120 inches). The elevation range of this unit is 1,212 to 3,182 meters (4000 to 10,500 feet). The dominant slopes range from 50 to 90 percent. The cirque basin portion of the map unit has slopes that range from 5 to 40 percent. The troughwall landforms are moderately to highly dissected by streams with the dominant stream pattern being parallel. The cirque headwall and cirque basin landforms are weakly dissected by streams with the dominant stream pattern being parallel. Wetlands are associated with the cirque basins, and occur as a minor component of this unit.

LTA Components: This landtype association consists of glacial troughwalls, cirque headwalls, and cirque basins.

Glacial troughwalls are formed in glacial tills on the lower elevation slopes with volcanic ash influenced colluvium on the higher elevation slopes. Slope gradients range from 50 to 90 percent. Soils on the lower slopes of this landform are moderately shallow to deep and are moderate to highly developed, with cobbly medium textures. The major soils on the lower slopes are classified as Andeptic and Typic Cryoboralfs. Soils on the upper slopes of this landform are shallow to moderately deep, are moderately developed, and have gravelly medium textures. The major soils on the higher slopes are Andic, Typic, and Lithic Cryochrepts. Rock outcrops occupy up to 15 percent of the area. The dominant potential natural vegetation series are grand fir, western redcedar, Douglas-fir and subalpine fir on the lower slopes; and subalpine fir and mountain hemlock on the upper slopes. This component represents 55 percent of the LTA.

Cirque headwalls/cirque basins are formed in glacial till on the lower elevation slopes and volcanic ash influenced colluvium on the higher elevation slopes. Included in this alpine landscape setting are small areas of alpine ridge landforms. Slope gradients range from 5 to 90 percent. Soils on these landforms are shallow to moderately deep, and weakly developed with very

gravelly medium textures. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. Rock outcrops occupy more than 40 percent of the area. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir. This component represents 45 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest

LTA43-M333C
LTA43-M332D
LTA43-M332C
LTA43-331D

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located mostly on the Rocky Mountain Front in the Lewis and Clark National Forest.

Acreage by Section

43-M333C	233
43-M332D	12,878
43-M332C	158,098
43-331D	624

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically occupied by fault escarpments (mostly in M332C), cirques, troughwalls, and ridges. The parent material is limestone.

Accessory Characteristics: The primary soils are Lithic Cryorthents and Cryochrepts. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). The dominant slope gradients are 70 to 90 percent. This LTA is moderately dissected by streams and the dominant drainage pattern is dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of steep west facing slopes, very steep glacial breaks, and rockland/scree on fault escarpments.

The steep west facing slopes are formed in limestone. These slopes have gradient ranging from 40 to 60 percent. Soils on these landscapes are shallow, poorly developed, and consist mainly of loam and flaggy gravel. These soils are classified as Lithic Cryorthents. Rock outcrop occurs on less than 15 percent of this landscape component. The dominant potential vegetation is open growing wind deformed Douglas-fir, limber pine, and spruce on scree. This component represents 30 percent of this LTA.

The very steep glacial breaks are formed in limestone. Slope gradients are mainly greater than 60 percent. The soil on this landscape is deep, poorly developed, and consist mainly of sandy-loam and gravel. These soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on seventy-five percent of this landscape component. The dominant potential vegetation is Douglas-fir series. This component represents 30 percent of this LTA.

The rockland/scree component of this LTA occurs on fault escarpments in limestone. Slopes are mainly greater than 60 percent. Soil on this landscape consists of sandy loam, loamy sand, gravel, and cobble. These materials are classified as scree. The dominant potential vegetation is subalpine fir, and whitebark pine-subalpine fir series. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest.

LTA44-M333C

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES, SHALES AND CARBONATES

Location: This map unit is located in the Swan, Flathead, and Whitefish mountain ranges of the Flathead River basin in northwest Montana.

Acreage by Section

44-M333C	218,230

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in upland and alpine landscape settings, which are primarily composed of glacial troughwall, cirque headwall and cirque basin landforms. Parent materials are alpine glacial debris and frost shattered colluvium derived from and underlain by Paleozoic and Mesozoic sandstone, shale, and limestone bedrocks.

Accessory Characteristics: The primary soils are shallow to moderately deep, with gravelly medium to moderately-fine textures. The vegetation is a mosaic of coniferous forest, alpine meadows, and shrubland associated with avalanche chutes. Mean annual precipitation ranges from 76 to 229 centimeters (30 to 90 inches). The elevation range is 1,033 to 2,590 meters (3500 to 8500 feet). The dominant slopes range from 50 to 90 percent. The cirque basin portion of the map unit has slopes that range from 5 to 40 percent. This LTA is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands are associated with the cirque basins, and occur as a minor component of this unit.

LTA Components: This landtype association consists primarily of glacial troughwalls, cirque headwalls, and cirque basins.

Glacial troughwalls are formed in glacial tills on the lower elevation slopes, and volcanic ash influenced colluvium on the higher elevation slopes. Slope gradients range from 50 to 90 percent. Soils on the lower slopes of this landform are moderately deep to deep, are moderate to highly developed, and have gravelly medium to moderately-fine textures. The major soils on the lower slopes are classified as Andeptic and Typic Cryoboralfs, clayey or loamy-skeletal, mixed. Soils on the upper slopes of this landform are shallow to moderately deep, are moderately developed and have gravelly medium textures. The major soils on the higher slopes are Andic, Typic, and Lithic Cryochrepts. Rock outcrops occupy up to 15 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir on the lower slopes; and subalpine fir on the upper slopes. This component represents 55 percent of the LTA.

Cirque headwalls/cirque basins are formed in glacial till on the lower slopes and volcanic ash influenced colluvium on the higher slopes. Included in this alpine landscape setting are small areas of alpine ridge landforms. Slope gradients range from 5 to 90 percent. Soils on these landforms are shallow to moderately deep, weakly developed, with gravelly medium to moderately-fine textures. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir. This component represents 40 percent of the LTA. Included in this map unit in the South and Middle Forks of the Flathead River are areas of moderately glaciated structural breaks. This inclusion represents up to 5 percent of the map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA50-M333C

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This map unit is located primarily in the Swan, Salish, Mission, Whitefish, and Flathead mountain ranges of the Flathead and Swan River basins, in northwest Montana.

Acreage by Section

50-M333C	687,672

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley bottom and upland landscape setting, which is primarily composed of glacial moraine landforms. Parent materials are continental or alpine glacial debris with or without volcanic ash surface layers; underlain by Proterozoic metasedimentary bedrock, composed of argillites, siltites, limestones, and quartzites.

Accessory Characteristics: The primary soils are moderately deep to very deep, with very gravelly moderately coarse and medium textures. The major vegetative cover is a dense coniferous forest with occasional meadow openings. Mean annual precipitation ranges from 36 to 203 centimeters (14 to 80 inches). The elevation range is 853 to 2,286 meters (2800 to 7500 feet). The dominant slopes range from 20 to 50 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists of glacial moraines with glacially scoured ridge tops as a minor component.

On the valley bottom landscape setting the glacial moraines occur on rolling hummocky topography, with slopes that range from 5 to 30 percent slope. On the upland landscape setting the glacial moraines occur on straight to slightly concave slopes, with range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toe-slope associated with glacial troughwalls.

Soils on these landforms are moderately deep to very deep, and are moderate to highly developed, with gravelly medium textures. The major soils are classified as Andeptic Cryoboralfs, Typic Eutroboralfs, and Dystric Cryochrepts. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is Douglas-fir, grand fir, and subalpine fir. This component represents 85 percent of this map unit.

Glacially scoured ridge tops are formed in residual soil materials. Slope gradients range from 5 to 20 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with gravelly medium textures. The major soils are classified as Andic Cryochrepts. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is subalpine fir and Douglas-fir. This component represents 15 percent of this map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA53-M333C
LTA53-M333B
LTA53-M332B

GLACIATED MOUNTAIN SLOPES: SANDSTONES, SHALES, AND CARBONATES

Location: This map unit is located in of the Swan, Mission, Flathead, and Whitefish mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

53-M333C	100,613
53-M333B	8,091
53-M332B	6,924

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley bottom and upland landscape settings, which are primarily composed of glacial moraine landforms. Parent materials are continental or alpine glacial debris with or without volcanic ash surface layers; underlain by Paleozoic and Mesozoic sandstone, shale, and limestone bedrocks. In the North Fork of the Flathead River areas of Tertiary siltstone are included in this map unit.

Accessory Characteristics: The primary soils are moderately deep to very deep, with gravelly medium and moderately fine textures. The major vegetative cover is a dense coniferous forest with occasional meadow openings. Mean annual precipitation ranges from 51 to 178 centimeters (20 to 70 inches). The elevation range is 1,036 to 2,316 meters (3400 to 7600 feet). The dominant slopes range from 5 to 50 percent. This map unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of glacial moraines with glacially scoured ridge tops as a minor component.

On the valley bottom landscape setting the glacial moraines occur on rolling hummocky topography, with slopes that range from 5 to 30 percent slope. On the upland landscape setting the glacial moraines occur on straight to slightly concave slopes, with range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toe-slope associated with glacial troughwalls.

Soils on these landforms are moderately deep to very deep, and are moderate to highly developed, with gravelly moderately-fine or fine textures. The major soils are classified as Typic Eutrochrepts and Andeptic Cryoboralfs. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir.

A minor component of this map unit is glacially scoured ridge tops. Slope gradients range from 5 to 20 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with gravelly medium textures. The major soils are classified as Andic Cryochrepts. Rock outcrops occupy less than 15 percent of the area. The dominant potential natural vegetation is subalpine fir and Douglas-fir. This component represents 15 percent of this map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA58-M333C
LTA58-M333B

GLACIATED MOUNTAIN SLOPES: HIGHLY WEATHERED BELT TILL

Location: This map unit is located in the Whitefish, Mission, Swan, Purcell, Salish, Cabinet, and Flathead mountain ranges of the Flathead, Kootenai, and Swan River basins in northwest Montana.

Acreage by Section

58-M333C	20,031
58-M333B	164,491

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in both upland and valley bottom landscape settings, which are typically composed of glacial moraine landforms. Parent materials are alpine or continental glacial debris deposited during Pre-Wisconsin glacial periods. These deposits are underlain by moderately metamorphosed, Proterozoic metasedimentary bedrock composed of argillites, siltites, dolomites, limestones, and quartzites; or Tertiary siltstones.

Accessory Characteristics: The primary soils are moderately deep to very deep very gravelly coarse silt/fine sandy loams. The major vegetative cover is a dense coniferous forest with occasional grassy openings. Mean annual precipitation ranges from 51 to 152 centimeters (20 to 60 inches). The elevation range is 667 to 1,707 meters (2200 to 5600 feet). The dominant slopes range from 20 to 50 percent. This map unit is moderately to highly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists primarily of glacial moraines.

The landscape setting for this map unit varies from a valley bottom to a moderately steep upland setting. In the valley bottom landscape settings, the glacial moraines occur on rolling, hummocky topography, with slopes that range from 5 to 30 percent slope. In the upland landscape setting the glacial moraines occur on straight to slightly concave slopes that range from 20 to 55 percent in gradient. These glacial moraines typically occur as the toe-slope associated with glacial troughwalls.

Soils on these landforms are moderately deep to very deep and are moderate to highly developed with gravelly moderately-fine or fine textures. The major soils are classified as Typic Glossoboralfs, Typic Eutrobtoralfs, and Andeptic Cryoboralfs. Rock outcrops occupy less than 5 percent of the area. The dominant potential natural vegetation is western redcedar, grand fir, subalpine fir, and Douglas-fir.

Compiled by: Dean Sirucek, Flathead National Forest and Louis Kuennen, Kootenai National Forest

LTA60-M333C
LTA60-M333B

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Swan, Purcell, Cabinet, Salish, Mission, and Flathead Mountain Ranges of the Flathead, Kootenai, and Swan River basin in northwest Montana.

Acreage by Section

60-M333C	114,155
60-M333B	497,972

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which are typically composed of dissected mountain slope, glaciated mountain slope, and glacially scoured ridge top landforms. The geomorphic processes that occur on these areas include: colluvial, fluvial and glacial, erosion or deposition. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, and limestones.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, mountain shrublands, and mountain grasslands. Mean annual precipitation ranges from 46 to 203 centimeters (18 to 80 inches). The elevation range is 758 to 2,286 meters (2500 to 7500 feet). The dominant slopes have gradients of 15 to 50 percent. This unit is moderate to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately deep and weak to moderately developed with medium textures. The major soils are classified as Lithic, Andic, or Typic Cryochrepts, and Typic and Lithic Dystrochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir-whitebark pine, subalpine fir and Douglas-fir. This landform component makes up 50 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering in place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, weak to moderate development, with medium textures. The major soils are classified as Andic Cryochrepts, Andeptic and Typic Cryoboralfs, and Typic or Argic Cryoborolls, Typic Haploborolls, and Typic Dystrochrept. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation series are Douglas-fir and subalpine fir. This landform component represents 50 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest.

LTA66-M333C
LTA66-M332C

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located primarily in the middle and southern part of the Rocky Mountain front in Northwest Montana.

Acreage by Section

66-M333C	164
66-M332C	37,295

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on ridgetops, plateaus, steep valley slopes, and benchy lower valley slopes. Parent materials are Paleozoic limestones.

Accessory Characteristics: The primary soils are moderately deep, skeletal loams, silt loams, and clay loams. The vegetation is a coniferous forest. Mean annual precipitation ranges from 50 to 127 centimeters (20 to 50 inches). The elevation range of this LTA ranges from 1524 to 2896 meters (5000 to 9500 feet). The dominant slopes have gradients of 10 to greater than 60 percent.

LTA Components: This landtype association consists of ridge tops and steep valley sideslopes which are typically formed on limestone.

Ridge tops typically have slopes of 10 to 25 percent. Soils on these landforms are moderately deep, weakly developed, and consist mainly of loamy skeletal silt loams, loams, and clay loams. The major soils are classified as Perelgic and Typic Cryoborolls. The major potential natural vegetation is rough fescue. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 30 percent of this LTA.

Steep valley sideslopes are on slopes of 25 to 60 percent. Soils on these landforms are moderately deep, moderately well developed, Andic Cryochrepts in the loamy skeletal families. The major potential natural vegetation is subalpine fir. Rock outcrop occurs on less than 15 percent of this LTA. This component represents 70 percent of this LTA.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA68-M333C
LTA68-M333B
LTA68-M333D

MOUNTAIN SLOPES AND RIDGES: SANDSTONES, SHALES, AND CARBONATES

Location: This unit is located in the Whitefish, Swan, and Flathead mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

68-M333C	36,067
68-M333B	8,043
68-M333D	1,511

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both upland and alpine landscape settings, which are typically composed of dissected mountain slopes, glaciated mountain slopes, and glacially scoured ridge top landforms. Colluvial, fluvial and glacial, erosional/depositional geomorphic processes occur in these areas. Parent materials are volcanic ash overlying weakly weathered Paleozoic and Mesozoic sandstone, shale, and limestone bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium and moderately fine textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grassland. Mean annual precipitation ranges from 51 to 177 centimeters (20 to 70 inches). The elevation range is 1,219 to 2,134 meters (4000 to 7000 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is moderate to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association consists of glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately deep, weak to moderately developed with medium and moderately fine textures. The major soils are classified as Lithic Andic, or Typic Cryochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir-whitebark pine, and subalpine fir. This landform component makes up 40 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering-in-place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, weak to moderate development, with medium and moderately fine textures. The major soils are classified as Andic Cryochrepts, Andeptic and Typic Cryoboralfs, and Typic or Argic Cryoborolls. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This landform component represents 60 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA70-M333C
LTA70-M333B
LTA70-M333D

FROST SHATTERED MOUNTAIN RIDGE TOPS, METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Cabinets, Purcell, Salish, Bitterroot, Swan, Mission, and Flathead Mountain ranges of the Clark Fork, Kootenai, and Flathead River basin in northwest Montana.

Acreage by Section

70-M333C	60,686
70-M333B	153,508
70-M333D	518,308

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a alpine landscape setting which is typically composed of a ridge top landform. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, dolomites and limestones. There are inclusions of other bedrocks, such as granite, in this map unit.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grasslands. Mean annual precipitation ranges from 102 to 279 centimeters (40 to 110 inches). The elevation range is 1,341 to 2,758 meters (4400 to 9100 feet). The dominant slopes have gradients of 10 to 40 percent. This map unit is undivided to slightly dissected by streams, with the pattern being dendritic where present.

LTA Components: This landtype association consists of glacially scoured, frost shattered ridge tops.

Glacially scoured, frost shattered ridge tops have been strongly modified by continental ice, alpine ice, and frost action. The prominent features are ridge tops that have been rounded or scoured by the previously mentioned actions. Exposed bedrock comprises 10 to 40 percent of the area. These areas have slopes that range from 5 to 50 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir, mountain hemlock, and whitebark pine-subalpine fir. This landform component makes up 90 percent of the map unit. There are up to 10 percent inclusions of nivalational hollows that occur in this map unit.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest.

LTA74-M333C

FROST SHATTERED MOUNTAIN RIDGE TOPS: SANDSTONES, SHALES, AND CARBONATES

Location: This unit is located in the Whitefish, Swan, and Flathead Mountain ranges of the Flathead River basin in northwest Montana.

Acreage by Section

74-M333C 9,208

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in an alpine landscape setting, which is typically composed of a ridge top landform. Parent materials are surface volcanic ash overlying weakly weathered Paleozoic and Mesozoic sandstone, shale, and limestone bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest and mountain shrublands and grasslands. Mean annual precipitation ranges from 89 to 229 centimeters (35 to 90 inches). The elevation range is 1,371 to 2,438 meters (4500 to 8000 feet). The dominant slopes have gradients of 15 to 40 percent. This map unit is undivided to slightly dissected by streams with the pattern being subparallel or dendritic where present.

LTA Component: This landtype association consists of glacially scoured, frost shattered ridge tops.

Glacially scoured, frost shattered ridge tops have been strongly modified by continental ice, alpine ice, and frost action. The prominent features are ridge tops that have been rounded by the previously mentioned actions. Exposed bedrock comprises 10 to 40 percent of the area. These areas have slopes that range from 15 to 50 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir. This landform component makes up 95 percent of the map unit. There are up to 5 percent inclusions of nivational hollows that occur in this map unit.

Compiled by: Dean Sirucek, Flathead National Forest

LTA90-M333C
LTA90-M333B

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in the Swan, Salish, Flathead, Mission, and Whitefish Mountain ranges of the Swan and Flathead River basins in northwest Montana.

Acreage by Section

90-M333C	58,472
90-M333B	1,358

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both upland and alpine landscape settings. Typically landslide areas are associated with structural breakland, stream breakland, glacial troughwall, and glacial moraine landforms. Parent materials are typically glacial tills underlain by Paleozoic and Mesozoic sandstone and shale bedrock; or Proterozoic argillite, siltite, quartzite, dolomite and limestone.

Accessory Characteristics: The primary soils are moderately deep to deep with gravelly medium to moderately fine textures. The vegetation is primarily coniferous forest with inclusions of shrublands. Mean annual precipitation ranges from 51 to 229 centimeters (20 to 90 inches). The elevation range is 914 to 2,316 meters (3000 to 7600 feet). The dominant slopes have gradients of 20 to 60 percent. This unit is slightly to moderately dissected by streams with the dominant stream pattern being deranged. Wetlands and small ponds are a major component of this unit.

LTA Components: This landtype association consists of surficial landslide and bedrock landslide deposits.

Surficial landslide deposits are formed in glacial till and colluvium parent materials. Slope gradients range from 20 to 50 percent. Soils on these landforms are moderately deep to deep and moderately developed with gravelly medium textures. These soils are classified as Typic and Andeptic Cryoboralfs, and Typic Eutroboralfs. Rock outcrop occurs on less than 10 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and western redcedar. This component represents 60 percent of this unit.

Bedrock landslide landforms are formed in residual and colluvial parent materials derived from native bedrock formations. Slope gradients range from 30 to 50 percent. Soils on these landforms are shallow to deep and moderately developed with gravelly medium and moderately fine textures. These soils are classified as Typic and Andeptic Cryoboralfs, Typic Eutroboralfs, and Andic Cryochrept. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is subalpine fir, Douglas-fir and western redcedar. This component represents 40 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest

CHAPTER 14

LTA Descriptions

Section M333D Bitterroot Mountains

This Section occurs in northern Idaho and western Montana. It generally coincides with the Metasedimentary Mountains geomorphic area previously described. Forty LTAs were mapped in this Section. See Appendix F for a complete list of LTAs and their acreage. Map unit descriptions are preceded by the following illustrations:

Figure 60: Map showing location of M333D within the Northern Region

Figure 61: M333D landscape photograph, Coeur d'Alene Mountains, Idaho Panhandle National Forests

Figure 62: Map showing distribution of LTAS within M333D

Figure 63: Bar chart showing abundance of landform groups within M333D

Figure 64: Bar chart showing abundance of geologic material groups within M333D

LTA10-M333D
LTA10-M333B
LTA10-M333C

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in the inter-mountain valleys of the Flathead, Clark Fork, and Kootenai River basins of northwest Montana.

Acreage by Section

10-M333D	160,219
10-M333B	191,377
10-M333C	63,658

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a valley bottom landscape setting, which is composed of stream terraces, floodplains, and alluvial basins. Parent materials are unstratified to stratified deposits of sands, silts, and/or gravels underlain primarily by Proterozoic metasediments, Cenozoic siltstones, and/or glacial deposits.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse to medium textures. The vegetation is a mosaic of deciduous forest, coniferous forest, and wet meadow/shrubland. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range of this LTA is 758 to 1,970 meters (2500 to 6500 feet). The dominant slopes have gradients of 3 to 15 percent. This LTA is moderately dissected by streams with the dominant stream pattern being dendritic. Wetlands and river over-flow channels are a major component of this LTA.

LTA Components: This landtype association consists of stream terraces, floodplains, and alluvial basins.

Stream terraces are formed in coarse, stratified alluvium. These terraces have slope gradients that range from 0 to 15 percent. Soils on these landforms are deep, poorly developed, and mostly of sand and gravel. The soils vary from moderately well drained to well drained. The major soils on the moderately well drained sites are Oxyaquic Udifluvents, Typic Ustifluvents and Typic Udifluvents. The major soils on the well drained sites are Dystric Eutrochrepts, Andic Dystrichrepts and Typic Xerochrepts. Rock outcrops occur less than 2 percent of the time. The dominant potential natural vegetation is black cottonwood, Engelmann spruce, western redcedar, grand fir, Douglas-fir and subalpine fir. This component represents 60 percent of the LTA.

Floodplains and alluvial basins are formed in coarse stratified or unstratified alluvium. These areas have slope gradients that range from 0 to 10 percent. Soils on these landforms are deep, weakly developed and consist mostly of sand, gravel, and silt. These soils vary from moderately well drained to poorly drained. The major soils are classified as Typic Endoaquents, or Typic and Aeric Endoaquents. Rock outcrops occur less than 1 percent of the time. The dominant potential natural vegetation is subalpine fir, Engelmann spruce and Drummond's willow. This component represents 40 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest

LTA11-M333D
LTA11-M333B
LTA11-M333C

VALLEYS: LACUSTRINE SEDIMENTS

Location: This unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

11-M333D	111,455
11-M333B	533,326
11-M333C	11,821

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a valley bottom landscape setting, which is typically composed of glacial lacustrine deposits that have level to slightly undulating topography. Parent materials consist of stratified lake sediments of very fine sands, silts, and clays.

Accessory Characteristics: The primary soils are deep with medium to moderately fine textures. The vegetation ranges from a continuous cover of coniferous vegetation on the well drained sites to wet meadow/shrubland on the poorly drained sites. Mean annual precipitation ranges from 36 to 152 centimeters (14 to 60 inches). The elevation range is 758 to 1,818 meters (2500 to 6000 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is slightly dissected by streams. Where present, the dominant stream pattern is dendritic. Wetlands and ponds are a major component of the unit.

LTA Components: This landtype association consists of lacustrine terraces and lacustrine basins.

Lacustrine terraces and lacustrine basins are formed in stratified lake sediments. These landforms have dominant slope gradients ranging from 0 to 25 percent. Included with these landforms are terrace risers/scarps that have slopes that range from 40 to 70 percent. Soils on these landforms are deep, weak to moderately developed with medium and moderately fine textures. In northwestern Montana the major soils on the forested, well-drained sites are classified as Glossic Cryoboralfs, Typic Eutroboralfs, and Eutric Glossoboralfs. In Section M333B additional major soils are Andic and Typic Dystrochrept. In the lower-elevation, non-forested, valleys the soils are classified as Typic Natrixeralfs and Typic Xerochrept. The dominant vegetation is western redcedar, subalpine fir, grand fir, and Douglas-fir

The major soils on the poorly drained sites are classified as Aerice Epiaquepts and Aquic Eutroboralfs with inclusions of Typic Borosaprists. Rock outcrop occurs on less than 2 percent of this landscape component. Engelmann spruce, Drummond's willow, and beaked sedge occur on the poorly drained sites.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest

LTA12-M333D
LTA12-M333B
LTA12-M333C

VALLEYS: OUTWASH AND OTHER OLDER COARSE ALLUVIAL DEPOSITS

Location: This map unit is located in the inter-mountain valleys of the Clark Fork, Flathead, and Kootenai River basins of northwest Montana.

Acreage by Section

12-M333D	181,889
12-M333B	428,208
12-M333C	97,651

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in valley bottom landscape settings, which are typically composed of glacial outwash plains or outwash terraces that have undulating surfaces. Steep escarpments form the front of the some of the terraces. Parent materials consist of either stratified or unstratified glacial fluvial deposits of sand and gravel material. These deposits are typically underlain by glacial moraine deposits or Proterozoic metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep with extremely gravelly coarse textures. These soils are typically excessively well drained with inclusions of poorly drained soils. The vegetation is primarily coniferous forest with areas of wet meadow/shrubland. Mean annual precipitation ranges from 36 to 140 centimeters (14 to 55 inches). The elevation range of this unit is 758 to 1,667 meters (2500 to 5500 feet). The dominant slopes have gradients of 2 to 20 percent. This map unit is moderate to highly dissected by streams or rivers with the dominant stream pattern being dendritic. Wetlands and riparian areas are important components of this unit.

LTA Components: This landtype association consists of glacial outwash plains and outwash terraces.

These glacial outwash plains and outwash terraces are formed in coarse, stratified or unstratified glacial fluvial sediments. Slope gradients range from 0 to 25 percent with gradients up to 50 percent on the terrace risers. Soils on these landforms are deep, weakly developed with extremely gravelly coarse textures. The major soils are classified as Dystric Eutrochrepts, Typic Dystrichrept, Andic Dystrichrepts, and Andic Ustochrepts. Rock outcrop occurs on less than 5 percent of this map unit. The dominant vegetation is Douglas-fir, western redcedar, subalpine fir, and Englemann spruce.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen. Kootenai National Forest

LTA14-M333D

VALLEYS: RECENT FINE ALLUVIUM

Location: This unit is located in the Bitterroot and St. Joe Mountains of Idaho in the Kelly Creek, St. Joe, and Coeur d'Alene River Basins.

Acreage by Section

14-M333D	41,867

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a valley bottom landscape setting, which is typically composed of floodplains, alluvial basins, and stream terraces. Parent materials are recent, fine, alluvial deposits primarily underlain by Belt series metasediments and granitics of the Idaho Batholith

Accessory Characteristics: The primary soils are moderately deep to deep with moderately fine to fine textures. The vegetation is a mosaic of moist to wet coniferous forest, riparian shrub communities, and mesic to wet meadows. Mean annual precipitation ranges from 76 to 114 cms. (30 to 45 inches). The elevation range is 610 to 1524 meters (2000 to 5000 feet). The dominant slopes have gradients of 0 to 10 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a major component of this unit.

LTA Components: This landtype association consists of floodplains, alluvial basins, and stream terraces.

Floodplains and alluvial basins are formed in moderately fine-textured recent alluvium. Slope gradients range from 0 to 3 percent. Soils on these landforms are deep, weakly to moderately developed, and consist mostly of silt loam and silty clay loam textures. These soils are classified as Typic Cryaquepts, Aquic Cryochrepts, and Cumulic Cryaquolls. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation are mesic to wet grass/sedge associations, willow/cottonwood/alder associations, and western redcedar and subalpine fir series. This component represents 80 percent of this unit.

Stream terraces are formed in mixed alluvium. Slope gradients range from 2 to 10 percent. Soils on these landforms are deep, weakly developed, and consist mostly of medium to moderately fine textures. These soils are classified as Typic Eutrochrepts and Dystric Cryochrepts. Rock outcrop occurs on less than 1 percent of this landscape component. The dominant potential natural vegetation series are western redcedar, grand fir, and subalpine fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA17-M333D

HILLS AND PLATEAUS: LOESS

Location: This unit is located in west-central Idaho on the Palouse Prairie, adjacent to the Potlatch River Canyon.

Acreage by Section

17-M333D	99,346

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills. Parent materials are a layer of wind blown loess, 2 to 30 meters (6 to 100 feet) thick underlain primarily by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay loam subsurface textures. The vegetation is a mosaic of prairie grasslands with forest vegetation at the higher elevations. Mean annual precipitation ranges from 51 to 76 cms. (20 to 30 inches). The elevation range is 610 to 914 meters (2000 to 3000 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in wind-blown loess exhibiting dune formations, in the Palouse Prairie near the Potlatch River Canyon. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam and silty clay loam subsurface textures. These soils are classified as Ultic Argixerolls, Ultic Haploxeralfs, and Pachic Ultic Haploxerolls. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is bluebunch wheatgrass and Idaho fescue in the prairie grasslands and ponderosa pine in forested areas.

Compiled by: Jim Mital, Clearwater National Forest

LTA20-M333D
LTA20-M333B
LTA20-M333C

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the St. Joe, Coeur d'Alene, Clearwater, Whitefish, Swan, Mission, Bitterroot, Purcell, Salish, Cabinet, and Flathead mountains. These are part of the Clark Fork, Coeur d'Alene, St. Joe, Clearwater, Flathead, and Kootenai River basins in northwest Montana and north Idaho.

Acreage by Section

20-M333D	1,000,850
20-M333B	212,411
20-M333C	163,793

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which are typically composed of structural break and stream break landforms. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, dolomites, and limestones.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, and mountain shrub/grass lands. Mean annual precipitation ranges from 36 to 229 centimeters (14 to 90 inches). The elevation range is 655 to 2,590 meters (2150 to 8500 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is slightly to moderately dissected by streams with the dominant stream patterns being sub-parallel and parallel. Major streams or rivers are typically located at the base of the stream breaks landforms. Lakes and ponds are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 100 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic, Typic and Andic Dystrochrepts on warm sites; and Lithic, Typic, and Andic Cryochrepts on colder sites. Rock outcrop and talus occur on 20 to 80 percent of this landscape component. The dominant potential natural vegetation on the warmer sites is Douglas-fir; and on the cooler sites are subalpine fir and whitebark pine-subalpine fir. This component represents 80 percent of this unit.

Stream breaks are the steep, mountain slopes adjacent to stream drainages, some of these steep slopes are dissected and other are not. Stream breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to greater than 100 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic and Typic Dystrochrepts on the warmer sites; and Lithic, Typic and Andic Cryochrepts on the cooler sites. In Idaho, the soils have thicker volcanic ash surface layers. Here the major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands, with xeric phases of these occurring on some of the southerly aspects. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop and talus occur on less than 10 to over 50 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, western redcedar, western hemlock, grand fir, and subalpine fir. This component represents 20 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest, Jerry Niehoff, Idaho Panhandle National Forests

LTA21-M333D
BREAKS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater Mountains of north-central Idaho in the Weitas, Cayuse, and North Fork Clearwater River Basins.

Acreage by Section

21-M333D 73,456

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are a mixed Mazama volcanic ashcap of variable thickness underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very gravelly sandy loams. The vegetation is primarily coniferous forest with numerous rock outcrops. Mean annual precipitation ranges from 89 to 152 cms. (35 to 60 inches). The elevation range is 762 to 1524 meters (2500 to 5000 feet). The dominant slopes have gradients of 60 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks, some of which may have formed along structural breaks.

Stream breaks are formed in colluvial materials from highly weathered granitic rocks of the Idaho Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to sandy loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Dystrochrepts, Andic Dystrochrepts, and Vitrandic Cryochrepts. Rock outcrop occurs on 15 to 35 percent of this landscape component. The dominant potential natural vegetation series are western redcedar, grand fir, and subalpine fir. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA22-M333D

BREAKS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the headwaters of Lolo Creek in the Bitterroot Mountains east of Lolo Pass on the Montana/Idaho border.

Acreage by Section

22-M333D	9,036

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a very steep, deeply eroded landscape setting which is typically composed of stream or structural breaks. Parent materials are a mixed Mazama volcanic ashcap of variable thickness underlain by weakly weathered granitics of the Idaho and Lolo Batholiths.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very gravelly sandy loams. The vegetation is primarily coniferous forest with numerous rock outcrops. Mean annual precipitation ranges from 114 to 203 cms (45 to 80 inches). The elevation range is 762 to 1524 meters (5000 to 7500 feet). The dominant slopes have gradients of 60 to 100 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel to dendritic. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks, some of which may have formed along structural breaks.

Stream breaks are formed in colluvial materials from weakly weathered granitic rocks of the Idaho and Lolo Batholiths with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 60 to 100 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to gravelly sandy loam surface textures, and very gravelly to cobbly subsurface textures. These soils are classified as Typic Cryochrepts, Dystric Cryochrepts, and Vitrandic Cryochrepts. Rock outcrop occurs on 15 to 35 percent of this landscape component. The dominant potential natural vegetation series are subalpine fir, Douglas-fir, and grand. This component represents 100 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA20-M333D
LTA20-M333B
LTA20-M333C

BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the St. Joe, Coeur d'Alene, Clearwater, Whitefish, Swan, Mission, Bitterroot, Purcell, Salish, Cabinet, and Flathead mountains. These are part of the Clark Fork, Coeur d'Alene, St. Joe, Clearwater, Flathead, and Kootenai River basins in northwest Montana and north Idaho.

Acreage by Section

20-M333D	1,000,850
20-M333B	212,411
20-M333C	163,793

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in both the upland and alpine landscape settings, which are typically composed of structural break and stream break landforms. Parent materials are volcanic ash overlying weakly weathered, moderately metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, dolomites, and limestones.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, and mountain shrub/grass lands. Mean annual precipitation ranges from 36 to 229 centimeters (14 to 90 inches). The elevation range is 655 to 2,590 meters (2150 to 8500 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is slightly to moderately dissected by streams with the dominant stream patterns being sub-parallel and parallel. Major streams or rivers are typically located at the base of the stream breaks landforms. Lakes and ponds are a minor component of this unit.

LTA Components: This landtype association consists of structural and stream breaks.

Structural breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to 100 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic, Typic and Andic Dystrochrepts on warm sites; and Lithic, Typic, and Andic Cryochrepts on colder sites. Rock outcrop and talus occur on 20 to 80 percent of this landscape component. The dominant potential natural vegetation on the warmer sites is Douglas-fir; and on the cooler sites are subalpine fir and whitebark pine-subalpine fir. This component represents 80 percent of this unit.

Stream breaks are the steep, mountain slopes adjacent to stream drainages, some of these steep slopes are dissected and other are not. Stream breaks are formed in colluvial materials from weakly weathered metasedimentary bedrock. Slope gradients range from 50 to greater than 100 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. These soils are classified as Lithic and Typic Dystrochrepts on the warmer sites; and Lithic, Typic and Andic Cryochrepts on the cooler sites. In Idaho, the soils have thicker volcanic ash surface layers. Here the major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands, with xeric phases of these occurring on some of the southerly aspects. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop and talus occur on less than 10 to over 50 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, western redcedar, western hemlock, grand fir, and subalpine fir. This component represents 20 percent of this unit.

Compiled by: Dean Sirucek, Flathead National Forest; Skip Barndt, Lolo National Forest; Louis Kuennen, Kootenai National Forest, Jerry Niehoff, Idaho Panhandle National Forests

LTA24-M333D

BREAKS: VOLCANICS

Location: This unit is located in the Clearwater River Basin of west-central Idaho.

Acreage by Section

24-M333D	14,019

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a very steep, deeply eroded landscape setting which is typically composed of stream breaks. Parent materials are weakly to moderately weathered Columbia flood basalts overlain with a variable thickness of wind-blown loess.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loams to very cobbly loams. The vegetation is a mosaic of grasslands with some shrubland and coniferous forest inclusions. Mean annual precipitation ranges from 51 to 89 cms (20 to 35 inches). The elevation range is 458 to 914 meters (1500 to 3000 feet). The dominant slopes have gradients of 60 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are generally not present in this unit.

LTA Components: This landtype association consists primarily of stream breaks.

Stream breaks are formed in colluvial materials from weakly to moderately weathered Columbia flood basalts with a variable layer of loess mixed in the surface layer. Slope gradients range from 60 to 80 percent. Soils on these landforms are shallow to moderately deep, weakly developed with silt loam to loam surface textures and very gravelly to cobbly subsurface textures. These soils are classified as Typic Haploxerolls, Lithic Argixerolls, and Ultic Argixerolls. Rock outcrop occurs on 20 to 40 percent of this landscape component. The dominant potential natural vegetation series are Idaho fescue, bluebunch wheatgrass, with ponderosa pine, Douglas-fir, and grand fir in the moister settings. This component represents 90 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA26-M333D

BREAKS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in the North Fork Clearwater River Basin in north central Idaho.

Acreage by Section

26-M333D 4,712

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of dissected stream breaks. Parent materials are moderately weathered gneiss, quartzite, and schist associated with the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep sandy loams and loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 46 to 114 centimeters (18 to 45 inches). The elevation range is 550 to 2000 meters (1800 to 6600 feet). The dominant slopes have gradients of 50 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in mixed volcanic ash influenced loess, residuum and colluvium of felsic metamorphic lithology. Soils on these landforms are moderately deep to very deep, moderately developed loams and sandy loams with sandy or loamy substrata. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, Dystric Cryochrepts, and Andic Dystrochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass and Idaho fescue, at mid-elevations Douglas-fir and grand fir, and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

LTA28-M333D
LTA28-M333A

DISSECTED BREAKS: METASEDIMENTARY (BELT)

Location: This unit is located in the Coeur d'Alene Mountains of the Bitterroot range, which are part of the Coeur d'Alene River basin of northern Idaho.

Acreage by Section

28-M333D	316,745
28-M333A	429

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, moderately steep to steep sloping, mountain sideslope and stream break landscape setting, which is typically composed of dissected lower mountain slopes and stream breaks comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly to moderately weathered quartzites, siltites and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 140 centimeters (25 to 55 inches). The elevation range of this unit is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 45 to 80 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being parallel. The landscapes of this area are all generally under 5000 feet and in a high rain-on-snow frequency area.

LTA Components: This landtype association consists of lower mountain slopes and breaks which have alternating dissected draws and spur ridges.

Dissected draws occur on moderately steep to steep slopes, and are formed in metasediments that consist of quartzites, siltites and argillites. The slope gradients range from 45 to 80 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils on the well drained sites within the draw are classified as Typic Udivitrands and Alfic Udivitrands, xeric phases of these occur on some of the southerly aspects. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop or scree occupies 10 to 30 percent of this unit. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock and grand fir. The dominant potential natural vegetation on the poorly drained sites is western redcedar. This component represents about 50 percent of this unit

Non-dissected spur ridges occur on moderately steep to steep slopes and are formed in the same Belt metasediment rock types stated in the landscape component above. The slope gradients range from 45 to 80 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils are classified as Typic Udivitrands, with xeric phases on dryer, southerly aspects. Moderately weathered soils consist of Alfic Udivitrands and Alfic Vitrixerands. Rock outcrop and scree occupies 10 to 30 percent of this unit. The dominant potential natural vegetation is western redcedar, western hemlock, grand fir and Douglas-fir. This component represents about 50 percent of this unit.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA26-M333D

BREAKS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located in the North Fork Clearwater River Basin in north central Idaho.

Acreage by Section

26-M333D 4,712

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is composed of dissected stream breaks. Parent materials are moderately weathered gneiss, quartzite, and schist associated with the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep sandy loams and loams. The vegetation is a mosaic of grassland and coniferous forest. Mean annual precipitation ranges from 46 to 114 centimeters (18 to 45 inches). The elevation range is 550 to 2000 meters (1800 to 6600 feet). The dominant slopes have gradients of 50 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected breaks.

Breaks are formed in mixed volcanic ash influenced loess, residuum and colluvium of felsic metamorphic lithology. Soils on these landforms are moderately deep to very deep, moderately developed loams and sandy loams with sandy or loamy substrata. These soils are classified as Ultic Haploxerolls, Typic Dystrochrepts, Dystric Cryochrepts, and Andic Dystrochrepts. Rock outcrop is less than 25 percent of the unit. The dominant potential natural vegetation at low elevations is bluebunch wheatgrass and Idaho fescue, at mid-elevations Douglas-fir and grand fir, and at high elevations subalpine fir.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. The major soils are classified as Andic, Dystric and Lithic Cryochrepts, and Vitric Haplocryands, and Vitric Fulvicryands. Rock outcrops occupy more than 40 percent of the area. The dominant potential natural vegetation is subalpine fir, and whitebark pine-subalpine fir. This component represents 45 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest, Jim Mital, Clearwater National Forest

LTA41-M333D

STEEP GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located in the Bitterroot Mountains on the Idaho/Montana border primarily in the Upper Lochsa River and Lolo Creek Basins.

Acreage by Section

41-M333D	24,915

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in a steep, alpine glacial landscape setting, which is typically composed of steep glacial slopes and headwalls. Parent materials are granitics of the Idaho Batholith overlain by a variable thickness of Mazama volcanic ash.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures and very gravelly to cobbly loam to sandy loam subsurface layers. The vegetation is a mosaic of coniferous forest, subalpine meadows, and rock outcrops. Mean annual precipitation ranges from 127 to 191 cms. (50 to 75 inches). The elevation range is 1524 to 2439 (5000 to 8000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and subalpine ponds are a major component of this unit.

LTA Components: This landtype association consists of a complex of steep, alpine glaciased slopes and headwalls intermixed across the landscape.

Steep, alpine, glaciased slopes and headwalls are formed in granitics of the Idaho Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 30 to 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and very gravelly, cobbly, and bouldery loamy subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Vitric Haplocryands. Rock outcrop occurs on 20 to 50 percent of this landscape component. The dominant potential natural vegetation are subalpine fir, whitebark pine, and wet grass/sedge meadows.

Compiled by: Jim Mital, Clearwater National Forest

LTA45-M333D
LTA45-M332E
LTA45-M332B

WEAKLY GLACIATED MOUNTAIN SLOPES AND RIDGES: GRANITE

Location: This unit is located in the Bitterroot and Sapphire mountain ranges of western Montana in the Bitterroot and Upper Clark Fork River Basins.

Acreage by Section

45-M333D	3,610
45-M332B	83,690
45-M332E	2,117

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation broad ridgetop position which is typically composed of weakly expressed glaciated slopes and basins that were formed by ice cap glaciers, minor valley glaciers, and strong periglacial frost shattering. Parent materials are a complex of frost shattered residuum and colluvium, intermixed with glacial till derived from moderately weathered granite.

Accessory Characteristics: The primary soils are shallow to deep, coarse soils with numerous rock fragments and have a volcanic ash surface layer. The vegetation is a mosaic of coniferous forest, stunted wind-deformed forest, and occasional small wet meadows. Mean annual precipitation ranges from 102 to 140 centimeters (40 to 55 inches). The elevation range is 2073 to 2743 meters (6800 to 9000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands and ponds are a minor component of this unit.

LTA Components: This landtype association consists of weakly developed glacial cirques and frost shattered mountain ridge tops.

Weakly developed glacial cirques are formed in residuum, colluvium, and till derived from a variety of rock types. Slope gradients range from 20 to 55 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of extremely bouldery loam volcanic ash surface layers overlying very stony loamy sand substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is alpine larch-subalpine fir, whitebark pine-subalpine fir, and subalpine fir series. This component represents 65 percent of this unit.

Frost shattered mountain ridge tops are formed in residuum and colluvium. Slope gradients range from 20 to 50 percent. Soils on this landform are shallow to deep and somewhat excessively drained. These soils are weakly developed and consist of very stony loam volcanic ash surface layers overlying very cobbly coarse sandy loam substrata. The dominant soils are classified as Lithic and Andic Cryochrepts. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is whitebark pine-subalpine fir, alpine larch-subalpine fir, and subalpine fir series. This component represents 35 percent of this unit.

Compiled by: Ken McBride, Bitterroot National Forest

LTA46-M333D

ALPINE TROUGHS AND TROUGHWALLS: GRANITICS

Location: This unit is located in the Bitterroot Mountains of Idaho in the Cayuse River Basin.

Acreage by Section

46-M333D	7,904

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs at higher elevations, in a gentle to steep, alpine glacial landscape setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are Mazama volcanic ash overlying weakly weathered granitic tills and bedrock of the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to moderately deep with textures ranging from silt loam to loam surface textures and very gravelly to cobbly loam subsurface layers. The vegetation is a mosaic of coniferous forest and rock outcrops. Mean annual precipitation ranges from 152 to 178 cms. (60 to 70 inches). The elevation range is 1219 to 1524 meters (4000 to 5000 feet). The dominant slopes range from 1 percent in the trough bottoms to more than 60 percent on the troughwalls. This unit is moderate to highly dissected by streams, with the dominant stream pattern being parallel. Wetlands and moist seeps a major component of this unit.

LTA Components: This landtype association consists of glacial troughwalls and glacial trough bottoms.

The glacial troughwalls are formed in granitics of the Idaho Batholith with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 40 to more than 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and very gravelly, cobbly, and bouldery loamy subsurface textures. These soils are classified as Andic Cryochrepts, Typic Cryochrepts, and Dystric Cryochrepts. Rock outcrop occurs on 10 to 30 percent of this landscape component. The dominant potential natural vegetation are subalpine fir, grand fir, and alder communities in moist seeps. This component represents about 70 percent of this unit.

The trough bottoms consist of glacial tills and glacio-fluvial materials from Idaho Batholith granitics with a mixed surface layer of Mazama volcanic ash of varying thickness. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep, weakly to moderately developed, and consist mostly of silt loam and loam surface textures and mostly unstratified very gravelly, and cobbly, loamy subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Haplocryands. Rock outcrops are uncommon. The dominant potential natural vegetation are subalpine fir, grass/sedge associations, and alder communities in moist seeps and wetlands. This component represents about 30 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA47-M333D

ALPINE TROUGHS AND TROUGHWALLS: METASEDIMENTARY (BELT)

Location: This unit is located in the Clark Fork, Coeur d'Alene, St. Joe, Clearwater, Flathead, and Kootenai river basins of northwest Montana and northern Idaho.

Acreage by Section

47-M333D	49,434

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs at the higher elevations, in a gentle to steep alpine glacial setting, which is typically composed of alpine trough bottoms and troughwalls. Parent materials are surface volcanic ash overlying weakly weathered tills consisting of quartzites, siltites, limestones, and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep sandy loams and loams, with inclusions of rock outcrop, scree and avalanche chutes. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 102 to 254 centimeters (40 to 100 inches). The elevation range of this unit is 1273 to 2576 meters (4200 to 8500 feet). The dominant slopes range from 1 percent in the trough bottoms to 85 percent on the steeper troughwalls. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel. Wet sidehill areas and grassy parks are a component of this LTA.

LTA Components: This landtype association consists of glacial troughwalls, glacial trough bottoms, cirque headwalls, and moderately dissected structural breaks.

These moderately steep to steep glaciated troughwalls consist of glacial till from metasedimentary bedrock sources. The slope gradients range from 25 to 85 percent. Soils on these landforms are shallow to deep, weakly weathered and medium textured. The major soils are classified as Vitric Haplocryands, Lithic Cryochrepts, and Andic Cryochrepts. Rock outcrops occupy more than 40 percent of some areas. The dominant potential natural vegetation is mountain hemlock and subalpine fir.

The trough bottoms consist of deep glacial tills and glacio-fluvial materials from metasedimentary bedrock sources. The slope gradients range from 1 to 40 percent. Soils on these landforms are deep, weakly weathered and medium textured. The major soils on the well drained sites are classified as Vitric Haplocryands. Vitric Fulvicryands mixed occur in depressional area and other poorly drained sites. The dominant potential natural vegetation are mountain hemlock and subalpine fir.

Cirque headwalls are formed in Proterozoic metasediments that consist of argillites, siltites, limestones, and quartzites. Slope gradients range from 35 to 85 percent. Soils on these landforms are shallow to moderately shallow and consist mainly of rock, sand, and gravel. The major soils are classified as Lithic Cryochrepts and Andic Cryochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir.

The moderately dissected breaks are developed on structural landforms. Slope gradients range from 50 to 80 percent. Soils on these landforms are deep, moderately developed and consist mostly rounded gravels and coarse silts/fine sands. The major soils are classified as Andic Dystrochrepts and Andic Cryochrepts. Rock outcrops occupy 15 to 25 percent of the area. The dominant potential natural vegetation is western redcedar and subalpine fir.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests and Louis Kuennen, Kootenai National Forest

LTA50-M333D
LTA50-M333B

GLACIATED MOUNTAIN SLOPES: METASEDIMENTARY (BELT)

Location: This map unit is located primarily in the Flathead, Clark Fork and Kootenai River basins of the Salish, Purcell, Bitterroot, and Cabinet Mountains of northwest Montana.

Acreage by Section

50-M333D	66,747
50-M333B	2,681,456

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both valley and upland settings mainly within a continentally glaciated landscape. Parent materials are continental and/or alpine glacial debris underlain by Proterozoic metasediments composed of argillites, siltites, limestones, and quartzites.

Accessory Characteristics: The primary soils are moderately shallow to very deep, very gravelly coarse silt and fine sandy loams. The major vegetative cover is a dense coniferous forest with occasional grassy openings. Mean annual precipitation ranges from 36 to 178 centimeters (14 to 70 inches). The elevation range of this LTA is 667 to 1667 meters (2200 to 5500 feet). The dominant slopes range from 20 to 50 percent. This map unit is slightly to moderately dissected by streams with the dominant stream pattern being dendritic. Bogs are a minor component of this map unit.

LTA Components: This landtype association has the classic subdued glacial landforms which are comprised of convex, scoured ridges and sideslopes, and valleys with deeper soils.

The straight side slopes and valleys are composed of a rounded ridges and filled in valleys landform. These areas have slopes that range from 5 to 60 percent. The ridges were strongly scoured and then covered by glacial debris. The drainage bottoms were filled in. The landforms (straight mountain slopes and concave lower side slopes) have soils that are moderately deep to very deep consisting of rock, fine sand and coarse silt. The major soils are classified as Andic Dystrochrepts, Typic Dystrochrepts, Typic Eutrochrepts, Typic Ustochrepts, Dystric Cryochrepts, and Andic Dystric Eutrochrept. Rock outcrops occupy less than 15 percent of the area. This landform is covered with a dense forest cover. The dominant potential natural vegetation series include western redcedar, western hemlock, subalpine fir, and Douglas-fir. This component represents 65 percent of the unit.

The ridge top landform is comprised of the convex feature of the landscape. The soils on this part of the landscape are moderately shallow to shallow. The major soils are classified as Lithic, Typic, and Andic Cryochrepts. The dominant potential natural vegetation series is subalpine fir. This component represents 35 percent of the map unit.

Compiled by: Louis Kuennen, Kootenai National Forest and Skip Barndt, Lolo National Forest

LTA51-M333D
LTA51-M333A

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located mostly in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

51-M333D	3,788
51-M333A	467,331

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a gentle to moderately steep valley bottom, mountain sideslope and ridge landscape setting at elevations that range from low to high. The unit is typically composed of dissected and non dissected mountain slopes, valleys and ridges comprised of alpine and continental till. Parent materials are surface volcanic ash overlying substratum materials of glacial tills derived from Cretaceous Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are shallow to deep sands, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range is 800 to 2062 meters (2625 to 6765 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected, continentally glaciated, convex ridges and concave valleys.

The glaciated convex ridges and mountain sideslopes were strongly scoured and then covered by varying thickness of glacial tills. The slope gradients range from near level to 60 percent. The drainage bottoms and toeslopes consist of deep glacial tills and glacio-fluvial materials. The slope gradients range from 0 to 40 percent. Soils on the ridge and mountain sideslopes landforms are shallow to deep, weakly weathered, and sandy textured. Soils in the drainage bottoms and toeslopes are deep, weakly weathered, and sandy textured. The major soils on the well drained sites are classified as Andic Cryochrepts and Andic Dystrochrepts, with Andic Xerochrepts on the drier sites. The areas with deeper ash caps are Vitric Haplocryands and Typic Udivitrands, Andic Cryumbrepts and Andic Haplumbrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in the scoured ridge and mountain sideslope landforms. The dominant potential natural vegetation on the well drained, high elevation sites is subalpine fir with western hemlock, western redcedar, grand fir and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation on the poorly drained sites is subalpine fir at the higher elevations and cold air pockets at lower elevations, and western redcedar at the mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA57-M333D
LTA57-M332A

GLACIATED MOUNTAIN SLOPES: GNEISSES, QUARTZITES, AND SCHISTS

Location: This unit is located in mid to high elevation glaciated areas of north central Idaho mainly in the Salmon and Clearwater River basins.

Acreage by Section

57-M333D	9,130
57-M332A	54,631

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit is composed of gently to moderately sloping alpine glaciated lands, including moraines, cirque basins, and trough bottoms. Parent materials are poorly weathered gneiss, quartzite, and schist associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams, loams and sandy loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 89 to 127 centimeters (35 to 50 inches). The elevation range is 1700 to 2500 meters (5500 to 8200 feet). The dominant slopes have gradients of 10 to 50 percent. This unit is moderately dissected by streams, with the dominant stream pattern being pinnate. Wetlands and lakes are significant inclusions in basins and depressions.

LTA Components: This landtype association consists of moraines, cirque basins, and trough bottoms.

Moraines are formed in volcanic ash influenced loess and glacial till of felsic metamorphic lithology. Slope gradients range from 5 to 50 percent. Soils on these landforms are moderately deep to very deep, weakly developed silt loams and gravelly sandy loams with cobbly loamy sand substrata. These soils are classified as Andic Cryochrepts and Dystric Cryochrepts, and Andic Cryumbrepts. Rock outcrop is less than 15 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir, and at high elevations subalpine fir. This component is 60 percent of the map unit.

Cirque basins are formed in volcanic ash influenced loess and glacial till of felsic metamorphic lithology. Slope gradients range from 1 to 30 percent. Soils on these landforms are moderately deep to very deep, weakly developed silt loams and gravelly sandy loams with very cobbly loamy sand substrata. These soils are classified as Andic Cryochrepts and Entic Cryumbrepts. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation is subalpine fir and sedge/shrub complexes. This component is 20 percent of the map unit.

Trough bottoms are formed in mixed volcanic ash influenced loess, glacial till and stratified outwash of felsic metamorphic lithology. Slope gradients range from 1 to 30 percent. Soils on these landforms are deep to very deep, weakly developed silt loams, and gravelly sandy loams with very cobbly loamy sand or sand substrata. These soils are classified as Andic Cryochrepts, Entic Cryumbrepts, and Andic Cryaquepts. The dominant potential natural vegetation is subalpine fir, grand fir and sedge/shrub complexes. This component is 20 percent of the map unit.

Compiled by: Pat Green, Nez Perce National Forest

LTA60-M333D

MOUNTAIN SLOPES AND RIDGES: METASEDIMENTARY (BELT)

Location: This unit is located in the Clark Fork, Coeur d'Alene, St. Joe and Clearwater River basins of northwest Montana and northern Idaho.

Acreage by Section

60-M333D 1,726,317

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, gentle to steep sloping, mountain sideslope and ridge landscape setting, which is typically composed of dissected and non dissected mountain slopes, nivalational hollows and ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly to moderately weathered quartzites, siltites and argillites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 178 centimeters (25 to 70 inches). The elevation range is 758 to 1818 meters (2500 to 6000 feet). The dominant slopes have gradients of 20 to 70 percent. This unit is slightly to strongly dissected by streams, with the dominant stream pattern being parallel to dendritic.

LTA Components: This landtype association consists of dissected and non-dissected mountain slopes, and glacially scoured ridges.

Dissected mountain slopes and nivalational hollows occur on moderately steep to steep slopes, and are formed in metasediments that consist of quartzites, siltites and argillites. The slope gradients range from 30 to 70 percent. Soils on these landforms are shallow to deep, weakly to moderately weathered and medium textured. The major soils on the well drained sites are classified as Typic Udivitrands, Alfic Udivitrands, Andic Dystrochrepts and Typic Dystrochrepts, with xeric phases of these on some southerly aspects. Rock outcrop and scree occupies less than 5 percent of this unit. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock, grand fir and subalpine fir.

Non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in the same Belt metasedimentary rock types stated in the landscape component above. The slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to deep weakly to moderately weathered and medium textured. The major soils are classified as Typic Udivitrands, Andic Dystrochrepts and Typic Dystrochrepts. Moderately weathered soils consist of Alfic Udivitrands and Alfic Vitrixerands. Rock outcrop and scree occupies from less than 5 up to 10 percent of the area. The dominant potential natural vegetation is western redcedar, western hemlock, grand fir, Douglas-fir and subalpine fir.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately shallow and consist of rock, sand and silt. The major soils are classified as Lithic Cryochrepts and Lithic Dystrochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests, and Louis Kuennen, Kootenai National Forest

LTA51-M333D
LTA51-M333A

GLACIATED MOUNTAIN SLOPES: GRANITICS

Location: This unit is located mostly in the Selkirk Mountains of the Priest, Pend Oreille and Spokane River basins of northwestern Idaho and northeast Washington.

Acreage by Section

51-M333D	3,788
51-M333A	467,331

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a gentle to moderately steep valley bottom, mountain sideslope and ridge landscape setting at elevations that range from low to high. The unit is typically composed of dissected and non dissected mountain slopes, valleys and ridges comprised of alpine and continental till. Parent materials are surface volcanic ash overlying substratum materials of glacial tills derived from Cretaceous Kaniksu Batholith bedrock.

Accessory Characteristics: The primary soils are shallow to deep sands, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 178 centimeters (30 to 70 inches). The elevation range is 800 to 2062 meters (2625 to 6765 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is slightly to highly dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of dissected and non-dissected, continentally glaciated, convex ridges and concave valleys.

The glaciated convex ridges and mountain sideslopes were strongly scoured and then covered by varying thickness of glacial tills. The slope gradients range from near level to 60 percent. The drainage bottoms and toeslopes consist of deep glacial tills and glacio-fluvial materials. The slope gradients range from 0 to 40 percent. Soils on the ridge and mountain sideslopes landforms are shallow to deep, weakly weathered, and sandy textured. Soils in the drainage bottoms and toeslopes are deep, weakly weathered, and sandy textured. The major soils on the well drained sites are classified as Andic Cryochrepts and Andic Dystrochrepts, with Andic Xerochrepts on the drier sites. The areas with deeper ash caps are Vitric Haplocryands and Typic Udivitrands, Andic Cryumbrepts and Andic Haplumbrepts occur in the more poorly drained sites. Rock outcrop and scree occurs as an inclusion in the scoured ridge and mountain sideslope landforms. The dominant potential natural vegetation on the well drained, high elevation sites is subalpine fir with western hemlock, western redcedar, grand fir and Douglas-fir occurring at low to mid elevations. The dominant potential natural vegetation on the poorly drained sites is subalpine fir at the higher elevations and cold air pockets at lower elevations, and western redcedar at the mid and lower elevations.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA62 -M333D

MOUNTAIN SLOPES AND RIDGES: WEAKLY WEATHRED GRANITICS

Location: This unit is located in the Coeur d'Alene, St. Joe and Clearwater Mountains of the Bitterroot range which are part of the Clark Fork, Coeur d'Alene, St. Joe and Clearwater River basins of northwest Montana and northern Idaho.

Acreage by Section

62-M333D	49,409

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to high elevation, gentle to steep sloping, mountain sideslope and ridge landscape setting, which is typically composed of dissected and non dissected mountain slopes, nivational hollows and ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash of varying depths overlying weakly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to deep loams and sandy loams, with a small component of rock outcrop and scree. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 152 centimeters (25 to 60 inches). The elevation range of this unit is 700 to 1615 meters (2300 to 5300 feet). The dominant slopes have gradients of 20 to 70 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being parallel to dendritic.

LTA Components: This landtype association consists of dissected and non-dissected mountain slopes, nivational hollows and ridges.

These dissected and non-dissected mountain slopes and nivational hollows occur on moderately steep to steep slopes, and are formed in granitics from the Idaho Batholith. The slope gradients range from 35 to 60 percent. Soils on these landforms are moderate deep to deep, weakly to moderately weathered and medium to coarse textured. The major soils on the well drained moist sites are classified as Typic Udivitrands. The major soils on the welldrained, dry sites are Andic Xerochrepts. Humic Udivitrands occur in the more poorly drained sites. Rock outcrop and scree occupies less than 5 percent of the unit. The dominant potential natural vegetation on the well drained, moist sites are western redcedar, western hemlock and grand fir. The dominant potential natural vegetation on the well drained, dry sites are grand fir and Douglas-fir. The dominant potential natural vegetation on the poorly drained sites are western redcedar.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA63-M333D

MOUNTAIN SLOPES AND RIDGES: SCHISTS AND GNEISSES

Location: This unit is located in the Clearwater and Coeur d'Alene Mountains of Idaho in the Potlatch and much of the North Fork Clearwater River Basins.

Acreage by Section

63-M333D	311,815

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a surface layer of Mazama volcanic ash underlain by schist and gneiss with high amounts of mica.

Accessory Characteristics: The primary soils are moderately deep to very deep with silt loam to loam surface textures and gravelly loam subsurface layers. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 127 cms. (25 to 50 inches). The elevation range is 762 to 1829 meters (2500 to 6000 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes and ridge tops.

Steep mountain slopes are formed in schist and gneiss colluvium overlain by Mazama volcanic ash. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to very deep, highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir. This component represents 80 percent of this unit.

Ridgetops are formed in gneiss and schist residuum and colluvium overlain by a mixed layer of Mazama volcanic ash. Slope gradients range from 15 to 50 percent. Soils on these landforms are shallow to deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Typic Udivitrands, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is western redcedar, grand fir, and Douglas-fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA64-M333D

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This unit is located along streams and rivers, on the western edge of the Coeur d' Alene and St. Joe river basins of northern Idaho.

Acreage by Section

64-M333D	123,010

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA consists of plateaus, mountain slopes, canyon walls and footslopes at generally low elevations. Parent materials are surface volcanic ash overlying poorly to moderately weathered Columbia River basalt.

Accessory Characteristics: The primary soils are moderately deep, stonyloams and stony silt loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 79 centimeters (25 to 30 inches). The elevation range of this unit is 640 to 975 meters (2100 to 3200 feet). The dominant slopes have gradients of 15 to 55 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of plateaus, mountain slopes, footslopes and canyon walls.

The plateaus, mountain slopes and footslopes are formed in mixed volcanic ash influenced loess overlying residuum and colluvium of basalt. Slope gradients range from 15 to 50 percent and the steeper canyon walls range from 50 to 65+ percent. Soils on these landforms are generally moderately deep, weakly to moderately weathered, and medium textured. These soils are classified as Typic Udivitrands, Typic Xerochrepts and Ultic Argixerolls. The dominant potential natural vegetation is grand fir on the well drained sites. Western redcedar will occur in the draws and on some north aspects at the higher elevation with deeper soils. Douglas-fir and ponderosa pine occur on the drier sites.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA66-M333D
LTA66-M333A

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This LTA is located adjacent to Lake Pend Oreille in the Coeur d'Alene Mountains on the Idaho Panhandle National Forests.

Acreage by Section

66-M333D	594
66-M333A	513

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain landscape setting, which is typically composed of stream dissected mountain slopes. Parent materials are Mazama volcanic ash over weakly weathered limestone bedrock associated with the Cambrian aged Lakeview formation. Small areas of Rennie shale and Gold Creek quartzite occur with the Lakeview limestone.

Accessory Characteristics: The primary soils are moderately deep to deep. They have silt loam surface soils overlying very gravelly to very cobbly sandy loam to loam subsoils. The vegetation is a coniferous forest. Mean annual precipitation ranges from 75 to 88 centimeters (30 to 35 inches). The elevation range of this LTA is 616 to 1280 meters (2000 to 4200 feet). The dominant slopes have gradients of 10 to 50 percent. This LTA is moderately dissected by streams with the dominant stream pattern being parallel.

LTA Components: This landtype association consists of mountain slopes.

Mountain slopes are formed in limestone bedrock. Slope gradients range from 10 to 50 percent. Soils on these landforms are moderately deep to deep, and well drained. They have a silt loam or loam surface layer underlain by very gravelly to very cobbly sandy loam and loam subsurface layers. These soils are classified as Andic Dystrochrepts and Typic Udivitrands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir, grand fir, western redcedar and western hemlock series. This component represents 100 percent of this LTA.

Compiled by: Gary Ford, Regional Office

LTA67-M333D

MOUNTAIN SLOPES AND RIDGES: QUARTZITES

Location: This unit is located in the Clearwater Mountains of Idaho in the upper North Fork Clearwater River Basin.

Acreage by Section

67-M333D 7,073

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a moderately sloping mountain slope and ridge landscape setting, which is typically composed of moderately dissected mountain slopes and ridgetops. Parent materials are a surface layer of Mazama volcanic ash underlain by highly weathered Revett quartzites .

Accessory Characteristics: The primary soils are moderately deep to very deep with silt loam to loam surface textures and gravelly loam subsurface layers. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 152 to 178 cms. (60 to 70 inches). The elevation range is 1067 to 1676 meters (3500 to 5500 feet). The dominant slopes have gradients of 30 to 60 percent. This unit is moderately to highly dissected by streams, with the stream pattern being dendritic to trellis. Wetlands and moist seeps are a common component of this unit.

LTA Components: This landtype association consists of steep mountain slopes and ridge tops.

Steep mountain slopes are formed in Revett quartzite colluvium overlain by Mazama volcanic ash. Slope gradients range from 30 to 60 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam to loam surface textures with gravelly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir. This component represents 80 percent of this unit.

Ridgetops are formed in Revett quartzite residuum and colluvium overlain by a mixed layer of Mazama volcanic ash. Slope gradients range from 15 to 50 percent. Soils on these landforms are moderate to deep, moderately to highly developed, and consist of silt loam to loam surface textures with gravelly to cobbly loam subsurface textures. These soils are classified as Andic Dystrochrepts, Andic Xerochrepts, and Vitric Hapludands. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation is western redcedar and grand fir. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA68-M333D
LTA68-M333B
LTA68-M333C

MOUNTAIN SLOPES AND RIDGES: SANDSTONES, SHALES, AND CARBONATES

Location: This unit is located in the Whitefish, Swan, and Flathead mountain ranges of the Flathead, Clearwater, and Blackfoot River basins in northwest Montana.

Acreage by Section

68-M333D	1,511
68-M333B	8,043
68-M333C	36,067

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in both upland and alpine landscape settings, which are typically composed of dissected mountain slopes, glaciated mountain slopes, and glacially scoured ridge top landforms. Colluvial, fluvial and glacial, erosional/depositional geomorphic processes occur in these areas. Parent materials are volcanic ash overlying weakly weathered Paleozoic and Mesozoic sandstone, shale, and limestone bedrock.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium and moderately fine textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grassland. Mean annual precipitation ranges from 51 to 177 centimeters (20 to 70 inches). The elevation range is 1,219 to 2,134 meters (4000 to 7000 feet). The dominant slopes have gradients of 55 to 70 percent. This unit is moderate to strongly dissected by streams with the dominant stream patterns being dendritic and sub-parallel.

LTA Components: This landtype association has glacially scoured ridge tops and dissected mountain slopes (fluvial) with inclusions of glaciated mountain slopes landform components.

Glacially scoured ridge tops have been strongly modified by continental ice. The prominent features are ridge tops and ridge noses with exposed bedrock. These areas have slopes that range from 10 to 45 percent. Soils on these landforms are shallow to moderately deep, weak to moderately developed with medium and moderately fine textures. The major soils are classified as Lithic, Andic, or Typic Cryochrepts. Rock outcrops occupy more than 50 percent of the area. The dominant potential natural vegetation is subalpine fir-whitebark pine, and subalpine fir. This landform component makes up 40 percent of the LTA.

The dissected mountain slopes (fluvial) landscape is one that is weathering-in-place. It is chemical weathering further affected by colluvial action. Slope gradients range from 30 to 60 percent. Soils on these landforms are moderately deep to deep, weak to moderate development, with medium and moderately fine textures. The major soils are classified as Andic Cryochrepts, Andeptic and Typic Cryoboralfs, and Typic or Argic Cryoborolls. Rock outcrops occupy less than 10 percent of the area. The dominant potential natural vegetation is Douglas-fir and subalpine fir. This landform component represents 60 percent of the LTA.

Compiled by: Dean Sirucek, Flathead National Forest

LTA70-M333D
LTA70-M333B
LTA70-M333C

FROST SHATTERED MOUNTAIN RIDGE TOPS: METASEDIMENTARY (BELT)

Location: This unit is located in the Whitefish, Cabinets, Purcell, Salish, Bitterroot, Swan, Mission, Coeur d'Alene, St. Joe, Clearwater, and Flathead Mountain ranges. These occur in the Clark Fork, Coeur d'Alene, St. Joe, Clearwater, Kootenai, and Flathead River basins in northwest Montana and north Idaho.

Acreage by Section

70-M333D	518,308
70-M333B	153,508
70-M333C	60,686

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in an alpine landscape setting which is typically composed of a ridge top landform. Parent materials are volcanic ash overlying weakly weathered, moderately-metamorphosed Proterozoic metasedimentary bedrock composed of argillites, siltites, quartzites, dolomites, and limestones. There are inclusions of other bedrocks, such as granite, in this map unit.

Accessory Characteristics: The primary soils are shallow to moderately deep with very gravelly medium textures. The vegetation is a mosaic of coniferous forest, mountain shrubland, and mountain grasslands. Mean annual precipitation ranges from 102 to 279 centimeters (40 to 110 inches). The elevation range is 1,341 to 2,758 meters (4400 to 9100 feet). The dominant slopes have gradients of 10 to 55 percent. This map unit is undivided to slightly dissected by streams, with the pattern being dendritic or parallel where present.

LTA Components: This landtype association consists of glacially scoured, frost shattered ridge tops.

Glacially scoured, frost shattered ridge tops have been strongly modified by continental ice, alpine ice, and frost action, and are formed in metasedimentary rocks. The prominent features are ridge tops that have been rounded or scoured by the previously mentioned actions. Exposed bedrock comprises 10 to 40 percent of the area. These areas have slopes that range from 10 to 60 percent. Soils on these landforms are shallow to moderately deep and weakly developed with very gravelly medium textures. The major soils are classified as Lithic Cryochrepts, Andic Cryochrepts and Vitric Haplocryands. The dominant potential natural vegetation is subalpine fir, mountain hemlock, and whitebark pine-subalpine fir. This landform component makes up 90 percent of the map unit. There are up to 10 percent inclusions of nivational hollows that occur in this map unit.

Compiled by: Dean Sirucek, Flathead National Forest; Louis Kuennen, Kootenai National Forest; Skip Barndt, Lolo National Forest and Jerry Niehoff, Idaho Panhandle National Forests

LTA71-M333D

FROST SHATTERED MOUNTAIN RIDGETOPS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater Mountains in Idaho, occurring extensively throughout the Lochsa and North Fork Clearwater River Basins.

Acreage by Section

71-M333D	181,557

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a high elevation mountain ridge landscape setting which is typically composed of frost shattered ridgetops and mountain slopes. Parent materials are a highly mixed surface layer of Mazama volcanic ash, colluvium, and residuum underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are moderately deep to deep with loamy to sandy loam surface textures and gravelly loam and sandy subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 89 to 203 cms. (35 to 80 inches). The elevation range is 1372 to 2438 meters (4500 to 8000 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of frost shattered mountain slopes and ridgetops.

Frost shattered mountain slopes are formed in colluvium of highly weathered Idaho Batholith granitics overlain by a variable thickness of Mazama volcanic ash. Slope gradients range from 30 to 55 percent. Soils on these landforms are moderately deep, weakly developed, and consist of loam to sandy loam surface textures with very gravelly, loamy sand or sandy loam subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Haplocryands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is subalpine fire and whitebark pine. This component represents 75 percent of this unit.

Frost shattered ridgetops are formed in residuum and colluvium of highly weathered Idaho Batholith granitics overlain by a variable thickness of Mazama volcanic ash. Slope gradients range from 20 to 40 percent. Soils on these landforms are moderately deep, weakly developed, and consist of loam to sandy loam surface textures with very gravelly, loamy sand or sandy loam subsurface textures. These soils are classified as Andic Cryochrepts, Dystric Cryochrepts, and Typic Cryochrepts. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine. This component represents 20 percent of this unit.

Compiled by: Jim Mital, Clearwater National Forest

LTA72-M333D
LTA72-M333A
LTA72-M333B

FROST SHATTERED MOUNTAIN RIDGE TOPS: WEAKLY WEATHERED GRANITICS

Location: This unit is located in the Selkirk, Purcell and Cabinet Mountains of the Priest, Kootenai, Pack River and Clark Fork River basins of northeast Idaho and northwest Montana. This unit is also located in the St. Joe Mountains of the Bitterroot Range, which is part of the St. Joe and Little North Fork of the Clearwater River basins of northern Idaho.

Acreage by Section

72-M333D	17,671
72-M333A	4,337
72-M333B	967

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a high elevation, gentle to moderately steep sloping, mountainsideslope and ridge landscape setting, which is typically composed of weakly to non dissected mountain slopes, and associated ridges comprised of colluvium and residuum. Parent materials are surface volcanic ash overlying weakly weathered granitics from Cretaceous Kaniksu Batholith and Idaho Batholith.

Accessory Characteristics: The primary soils are shallow to deep sands, sandy loams and loams, with up to 30 percent rock outcrop and scree on some units. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 114 to 178 centimeters (45 to 70 inches). The elevation range of this unit is 1433 to 1981 meters (4700 to 6500 feet). The dominant slopes have gradients of 20 to 55 percent. This unit is weakly to non-dissected by streams, with the dominant stream pattern being parallel when they occur.

LTA Components: This landtype association consists of weakly to non-dissected mountain slopes and associated ridges.

Weakly to non-dissected mountain slopes and ridges occur on gentle to moderately steep slopes and are formed in batholith that consists of granite, granodiorite or other rocks of similar composition. The slope gradients range from 10 to 60 percent. Soils on these landforms are shallow to deep, weakly weathered and coarse to medium textured. The major soils are classified as Vitric Haplocryands and Andic Cryochrepts. These soils make up the majority of the unit and occur on the well drained sites. Vitric Fulvicryands and Andic Cryumbrepts occur in the poorly drained sites. The shallow soils are classified as Lithic Haplocryands and Lithic Cryochrepts. The dominant potential natural vegetation series over most of the area is subalpine fir, but mountain hemlock is dominant in the St. Joe and Little North Fork of the Clearwater River basins. Minor Douglas-fir occurs on the very dry sites.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA80-M333D

LOW RELIEF HILLS: METASEDIMENTARY (BELT)

Location: This unit is located in the St Joe and Clearwater Mountains of the Bitterroot range, which are part of the St. Joe and Clearwater River basins of northwest Montana and northern Idaho.

Acreage by Section

80-M333D	122,360

LTA Setting and General Characteristics

Differentiating characteristics: This map unit occurs in a low to mid elevation, gentle to moderately sloping, mountain sideslope and ridge landscape setting, which is composed of highly dissected mountain slopes and associated ridges comprised deeply weathered residuum. Parent materials are surface volcanic ash overlying moderately to highly weathered quartzites, and siltites from Precambrian metasedimentary bedrock.

Accessory Characteristics: The primary soils are deep sandy loams, loams and clay loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 89 to 152 centimeters (35 to 60 inches). The elevation range of this unit is 655 to 1524 meters (2150 to 5000 feet). The dominant slopes have gradients of 20 to 60 percent. This unit is highly dissected, but many of the dissections do not have live stream channels. The stream pattern is strongly dendritic.

LTA Components: This landtype association consists of highly dissected mountain slopes and associated ridges.

Highly dissected mountain slopes and associated ridges occur on gentle to moderately steep slopes and are formed in metasediments that consist of quartzites, siltites and inclusions of schists. The slope gradients range from 10 to 60 percent. Soils on these landforms are deep, moderately to highly weathered and medium textured. The major soils on the well drained sites are classified as Typic Udivitrands and Alfic Udivitrands. Humic Udivitrands occur in the more poorly drained sites. The dominant potential natural vegetation on the well drained sites are western redcedar, western hemlock, and grand fir. The dominant potential natural vegetation on the poorly drained sites is western redcedar.

Compiled by: Jerry Niehoff, Idaho Panhandle National Forests

LTA81-M333D

LOW RELIEF HILLS: HIGHLY WEATHERED GRANITICS

Location: This unit is located in the Clearwater Mountains of Idaho in the St. Maries, St. Joe, Lochsa, and North Fork Clearwater River Basins.

Acreage by Section

81-M333D	270,383

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are Mazama volcanic ash underlain by highly weathered granitics of the Idaho Batholith.

Accessory Characteristics: The primary soils are deep to very deep with silt loam and loam surface textures and loam to gravelly loam subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 127 cms.(30 to 50 inches). The elevation range is 610 to 1524 meters (2000 to 5000 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in highly weathered granitic residuum overlain by Mazama volcanic ash. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam and loam surface textures and loam to gravelly loam subsurface textures. These soils are classified as Typic Udivitrands, Alfic Udivitrands, and Vitric Hapludands. Rock outcrop is uncommon in this landscape component. The dominant potential natural vegetation is western redcedar, grand fir, and western hemlock.

Compiled by: Jim Mital, Clearwater National Forest

LTA82-M333D

LOW RELIEF HILLS: VOLCANICS

Location: This unit is located in west-central Idaho in the Potlatch and North Fork Clearwater River Basins.

Acreage by Section

82-M333D	43,729

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are wind-blown loess and Mazama volcanic ash underlain by Columbia flood basalts.

Accessory Characteristics: The primary soils are deep to very deep with silt loam and loam surface textures and gravelly silt loam to silty clay subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 114 cms. (25 to 45 inches). The elevation range is 762 to 1219 meters (2500 to 4000 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in Columbia flood basalt residuum overlain by wind-blown loess and Mazama volcanic ash. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam and loam surface textures and silt loam to gravelly silt loam and silty clay subsurface textures. These soils are classified as Ultic Argixerolls, Ultic Haploxeralfs, and Andic Xerochrepts. Rock outcrop are uncommon on this landscape component. The dominant potential natural vegetation is grand fir, Douglas-fir, and western redcedar.

Compiled by: Jim Mital, Clearwater National Forest

LTA83-M333D

LOW RELIEF HILLS: FINE TERTIARY SEDIMENTS

Location: This unit is located in west-central Idaho in the St. Maries, Palouse, and North Fork Clearwater River Basins.

Acreage by Section

83-M333D	292,046

LTA Setting and General Characteristics

Differentiating characteristics: This LTA occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are Mazama volcanic ash and wind-blown loess underlain by Tertiary alluvial deposits.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 76 to 127 cms. (30 to 50 inches). The elevation range is 762 to 1372 meters (2500 to 4500 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in Tertiary alluvium overlain by Mazama volcanic ash and wind-blown loess. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam to silty clay subsurface textures. These soils are classified as Alfic Udivitrands, Typic Udivitrands, Ultic Haploxeralfs, Typic Eutroboralfs, and Eutric Glossoboralfs. Rock outcrops are uncommon on this landscape component. The dominant potential natural vegetation is western redcedar and grand fir.

Compiled by: Jim Mital, Clearwater National Forest

LTA84-M333D

LOW RELIEF HILLS: HIGHLY WEATHERED SCHISTS

Location: This unit is located in west-central Idaho in the Potlatch, Marble Creek, St. Maries Creek, and North Fork Clearwater River Basins.

Acreage by Section

84-M333D	294,317

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a low to mid elevation, gently to moderately sloping landscape setting which is typically composed of low relief rolling hills and low mountains. Parent materials are Mazama volcanic ash underlain by highly weathered schists.

Accessory Characteristics: The primary soils are deep to very deep with silt loam surface textures and silt loam to silty clay loam subsurface textures. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 64 to 114 cms. (25 to 45 inches). The elevation range is 762 to 1524 meters (2500 to 5000 feet). The dominant slopes have gradients of 5 to 30 percent. This unit is highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of low relief rolling hills.

Low relief rolling hills are formed in highly weathered schists overlain by Mazama volcanic ash. Slope gradients range from 5 to 30 percent. Soils on these landforms are deep to very deep, highly developed, and consist of silt loam surface textures and silt loam to silty clay loam subsurface textures. These soils are classified as Typic Udivitrands, Typic Hapludands, and Vitric Hapludands. Rock outcrops are uncommon on this landscape component. The dominant potential natural vegetation is western redcedar and grand fir.

Compiled by: Jim Mital, Clearwater National Forest

LTA85-M333D

LOW RELIEF HILLS: MODERATELY WEATHERED GNEISSES, QUARTZITES AND SCHISTS

Location: This unit is located at middle elevations in north central Idaho in the Clearwater River Basins.

Acreage by Section

85-M333D	19,796

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is rolling uplands developed in volcanic ash over moderately weathered residuum of gneiss, schist, and quartzite associated with the Idaho batholith.

Accessory Characteristics: The primary soils are deep to very deep silt loams. The vegetation is dominantly coniferous forest. Mean annual precipitation ranges from 102 to 152 centimeters (40 to 60 inches). The elevation range is 1373 to 1983 meters (4500 to 6500 feet). The dominant slopes have gradients of 10 to 40 percent. This unit is moderately to highly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this map unit.

LTA Components: This landtype association consists of rolling hills.

Rolling hills are formed in volcanic ash over quartzite, gneiss, and schist residuum. Soils on these landforms are very deep, moderately developed silt loams with gravelly sandy loam substrata. These soils are classified as Andic Dystrochrepts, Typic Udivitrands, and Vitric Hapludands. Rock outcrop is less than 10 percent of the unit. The dominant potential natural vegetation at mid elevations is grand fir series, and at upper elevations subalpine fir series. Western red cedar and alder communities in moist openings are common near the north part of the Clearwater River basin.

Compiled by: Pat Green, Nez Perce National Forest, and Jim Mital, Clearwater National Forest

LTA90-M333D

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This unit is located in west-central Idaho in the North Fork Clearwater and St. Maries River Basins.

Acreage by Section

90-M333D	16,505

LTA Setting and General Characteristics

Differentiating characteristics: This map unit is mass wasted slopes. Parent materials can be of any lithology, but in this section they are dominantly gneisses and schists overlain with a variable thickness of Mazama volcanic ash.

Accessory Characteristics: The primary soils are deep to very deep silt loams to cobbly loams. The vegetation is a mosaic of coniferous forest. Mean annual precipitation ranges from 51 to 102 cms. (20 to 40 inches). The elevation range is 457 to 1372 meters (1500 to 4500 feet). The dominant slopes have gradients of 30 to 80 percent. This unit is moderately dissected by streams, with the dominant stream pattern being parallel to dendritic. Wetlands are a minor component of this unit, but moist seeps can be locally common.

LTA Components: This landtype association consists of mass wasted slopes.

Mass wasted slopes are formed in Mazama volcanic ash overlying primarily gneisses and schists. Slope gradients range from 30 to 80 percent. Soils on these landforms are deep to very deep, weakly to moderately developed loams to cobbly loams. Soil classification is highly variable but many are classified as Andic Dystrocrepts and Vitrandic Dystrochrepts. Rock outcrops occur on less than 10 percent of this unit. The dominant potential natural vegetation is grand fir, western redcedar, and Douglas-fir.

Compiled by: Jim Mital, Clearwater National Forest

CHAPTER 15

LTA Descriptions

Section 251A Red River Valley

Section 251B North Central Glaciated Plains

Section 331D Northwestern Glaciated Plains

Section 331F Northwestern Great Plains

Section 331G Powder River Basin

Section 342A Bighorn Basin

Section M331B Big Horn Mountains

This chapter contains map unit descriptions for those landtype associations which occur in Sections with limited amounts of Forest Service Ownership. Due to the limited extent of LTA occurrence within these Sections, the detailed analysis of LTAs included in other chapters is not warranted here.

There are four general areas covered in this chapter: the Highwood Mountains of the Lewis and Clark National Forest (portions of Section 331D); the Sheyenne National Grasslands (portions of Sections 251A); the Bighorn Mountains (portions of Section M331B, including a small portion of the adjacent Bighorn Basin); and the remaining portions of the Custer National Forest in eastern Montana and North Dakota (portions of Section 331F and 331G). Map unit descriptions are preceded by the following illustrations:

- Figure 65:** 251A landscape photograph
Sheyenne National Grassland, Custer National Forest
- Figure 66:** Bar chart showing abundance of landform groups within 251A
- Figure 67:** Bar chart showing abundance of geologic material groups within 251A
- Figure 68:** Bar chart showing abundance of landform groups within 251B
- Figure 69:** Map showing location of Great Plains minor units.
- Figure 70:** Bar chart showing abundance of geologic material groups within 251B
- Figure 71:** Map showing location of 331D within the Northern Region
- Figure 72:** Bar chart showing abundance of landform groups within 331D
- Figure 73:** Bar chart showing abundance of geologic material groups within 331D
- Figure 74:** Map showing location of 331F within the Northern Region
- Figure 75:** Landscape photograph, Section 331F
Custer National Forest

- Figure 76:** Bar chart showing abundance of landform groups within 331F
- Figure 77:** Bar chart showing abundance of geologic material groups within 331F
- Figure 78:** Map showing location of 331G within the Northern Region
- Figure 79:** Landscape photograph 331G, Custer National Forest
- Figure 80:** Bar chart showing abundance of landform groups within 331G
- Figure 81:** Bar chart showing abundance of geologic material groups within 331G
- Figure 82:** Map showing location of M331B within the Northern Region
- Figure 86:** Landscape photograph Section M331B, Custer National Forest
- Figure 87:** Bar chart showing abundance of landform groups within M331B
- Figure 88:** Bar chart showing abundance of geologic material groups within M331B
- Figure 89:** Map showing location of 342A within the Northern Region
- Figure 90:** Bar chart showing abundance of landform groups within 342A
- Figure 91:** Bar chart showing abundance of geologic material within 342A

SHEYENNE NATIONAL GRASSLANDS

SECTION 251A RED RIVER VALLEY

This Section occurs in the eastern most portion of North Dakota and western most portion of Minnesota and includes a portion of the Sheyenne National Grassland. This Section consists of the southern extension of a large, level lacustrine plain, Glacial Lake Agassiz, that extends far to the north and west. The plain is dissected by the Red River valley. Pleistocene till and lacustrine sand-silt-clay-peat-muck cover the bedrock to a depth of 200 to 400 feet. Quaternary alluvium covers the lacustrine sediments in the fans and major river valleys. Bedrock is predominantly Archean granite, metasediments, and greenstone; Cretaceous shale and minor Jurassic sandstone overlap the Archean on the western and southern margins.

LTA8-251A

GLACIOLACUSTRINE PLAINS: DELTAIC SEDIMENTS

Location: This unit is located in eastern North Dakota on the Custer National Forest.

Acreage by Section

251A	44,171

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a flat glacial lake deltaic lake plain landscape setting, which is typically composed of nearly level lake sediments. Parent materials are medium textured glacially derived lacustrine and eolian deposits underlain by thick sequence of glacial till.

Accessory Characteristics: The primary soils are deep, with coarse to moderately fine textures. The vegetation is a mosaic of cropland and prairie grasslands. Mean annual precipitation is about 53 cms. (21 inches). The elevation ranges from 300 to 335 meters (980 to 1100 feet). The dominant slopes have gradients of 0 to 3 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of nearly level deltaic plains.

Deltaic plains are formed in lacustrine and eolian deposits. Slope gradients range from 0 to 3 percent. Soils on these landforms are deep, moderately to strongly developed, with coarse to moderately fine textures. These soils are classified as Pachic Udic Haploborolls, Typic Haplaquolls, Typic Calciaquolls, and Typic Natraquolls. The dominant potential natural vegetation is big bluestem and wooly sedge. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA9-251A

GLACIO-LACUSTRINE PLAINS: SANDHILLS AND SAND DUNES

Location: This unit is located in eastern North Dakota on the Custer National Forest.

Acreage by Section

9-251A 73,167

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a flat glacial lake deltaic plain landscape setting, which is typically composed of dunes, hummocks and swales. Parent materials are glacially derived eolian underlain by thick sequence of glacial till.

Accessory Characteristics: The primary soils are deep, with coarse textures. The vegetation is a mosaic of prairie grasslands. Mean annual precipitation is about 53 cms (21 inches). The elevation range is 300 to 340 meters (980 to 1120 feet). The dominant slopes have gradients of 0 to 20 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic and unintegrated. Wetlands are a major component of this unit.

LTA Components: This landtype association consists of dunes, hummocks and swales.

Dunes are formed in eolian deposits. Slope gradients range from 0 to 20 percent. Soils on these landforms are deep, poorly developed and have coarse textures. These soils are classified as stable dunes and Typic Udipsamments. The dominant potential natural vegetation includes hairy grama, needle and thread, sand bluestem, bur oak and aspen. This component represents 40 percent of this unit.

Hummocks are formed in eolian deposits. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, poorly developed, and have coarse textures. These soils are classified as Typic Udipsamments, Udic Haploborolls, and Udorthentic Haploborolls. The dominant potential natural vegetation includes big bluestem, and needle and thread. This component represents 30 percent of this unit.

Swales are formed in eolian deposits. Slope gradients range from 0 to 20 percent. Soils on these landforms are deep, poorly developed and have coarse textures. These soils are classified as Typic Udipsamments. The dominant potential natural vegetation includes wooly sedge in the deeper depressions and big bluestem on more xeric positions. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA13-251A

VALLEYS: FINE GLACIAL SEDIMENTS

Location: This unit is located in the Sheyenne River Valley in southeastern North Dakota on the Custer National Forest.

Acreage by Section

13-251A	13,659

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a flat glacial lake deltaic plain landscape setting, which is typically composed of stream bottoms and terraces. Parent materials are alluvium derived from glacial till underlain by deeper glacial outwash materials.

Accessory Characteristics: The primary soils are deep, with medium and moderately fine textures. The vegetation is a mosaic of deciduous forest and cropland. Mean annual precipitation is about 53cms. (21 inches). The elevation range is 290 to 325 meters (950 to 1100 feet). The dominant slopes have gradients of 0 to 4 percent. This unit is slightly dissected by streams or drainages, with the dominant stream pattern being dendritic. Wetlands are a major component of this unit.

LTA Components: This landtype association consists of stream bottoms and terraces.

Stream bottoms are formed in fine alluvium. Slope gradients range from 0 to 4 percent. Soils on these landforms are deep, poorly to strongly developed, with medium to moderately fine textures. These soils are classified as Mollic Udifluvents, and Cumulic Udic Haploborolls. The dominant potential natural vegetation includes basswood and green ash. This component represents 70 percent of this unit.

Terraces are formed in fine alluvium. Slope gradients range from 0 to 6 percent. Soils on these landforms are deep, strongly developed, with medium to fine textures. These soils are classified as Cumulic Udic Haploborolls, and Udertic Haploborolls. The dominant potential natural vegetation includes bur oak, green ash and basswood. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

SECTION 331D NORTHWESTERN GLACIATED PLAINS

This Section occurs in north central and north east Montana. It consists of level to gently rolling continental glacial till plains and rolling hills on the Missouri Plateau. The glacial till is underlain by soft Cretaceous marine shale.

LTA10-331D
LTA10-M332D
LTA10-M332C

VALLEYS: RECENT COARSE ALLUVIUM

Location: This LTA is located in all mountain ranges of the Lewis and Clark and Helena National Forests.

Acreage by Section

10-331D	982
10-M332D	86,889
10-M332C	17,094

LTA Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a valley bottom landscape setting which is usually composed of stream terraces, floodplains, and alluvial fans. Parent materials are stratified alluvial deposits of sands, silts and gravels.

Accessory Characteristics: The primary soils are deep gravelly to extremely gravelly sandy loams and loams. The vegetation is a mosaic of deciduous forest, coniferous forest, well drained grassland and wet meadow. Mean annual precipitation ranges from 38 to 75 centimeters (15 to 30 inches). The elevation range of this LTA is 1159 to 1983 meters (3800 to 6500 feet). The dominant slopes are 0 to 4 percent. This LTA by nature has very high stream densities. Wetlands are an important component of this LTA.

LTA Components: This landtype association consists of floodplains, and stream terraces/and alluvial fans.

Floodplains and lower terraces are formed in a variety of stratified alluvium. These floodplains have slope gradients that range from 0 to 2 percent. Soils on these landforms are very deep, poorly developed, and consist mainly of sand, gravel and cobble. Silts and clays are found to a lesser extent in oxbow positions and areas historically occupied by beaver dams. The major soils are highly variable and include Fluvents, Aquepts, Aquepts, Aquolls and Borolls. The dominant potential natural vegetation is Englemann spruce and subalpine fir series, with inclusions of black cottonwood. This component represents 60 percent of this LTA.

Higher terraces and included fans are formed in alluvium. These terraces have slope gradients that range from 0 to 4 percent. The alluvial fans often have slope gradients of 8 to 25 percent. Soils on these landforms are deep, poorly to well developed, and consist mainly of gravelly to extremely gravelly sandy loams and loams. Sand, gravel and/or cobble layers or lenses are often present. Areas of silt and clay are present in old oxbow and beaver dam locations as well as glacial ice dams. The major soils are classified as Haploborolls and Cryoborolls. The dominant potential natural vegetation is Douglas-fir, rough fescue, and big sagebrush series. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena and Lewis and Clark National Forests

LTA27-331D
LTA27-M333C
LTA27-M332C

BREAKS: CARBONATES

Location: This LTA is located in the Big Belt, Little Belt, and Snowy Mountains in the Missouri River Basin.

Acreage by Section

27-331D	148
27-M333C	459
27-M332C	97,585

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a very steep, deeply eroded or faulted mountainous landscape setting, which is typically composed of structural breaks. Parent materials are colluvium and residuum underlain by limestone.

Accessory Characteristics: The primary soils are moderately deep or deeper. They are medium textured with high rock contents throughout. The vegetation is a mosaic of coniferous forest and forested scree, with substantial rock outcrops. Mean annual precipitation ranges from 25 to 75 centimeters (10 to 30 inches). The elevation range of this LTA is 1159 to 2288 meters (3800 to 7500 feet). The dominant slopes have gradients of 60 to 90 percent. This LTA is highly to slightly dissected (closely to widely spaced drainages) and weakly or moderately incised by streams, with the dominant stream patterns being subparallel.

LTA Components: This landtype association consists of structural breaks.

Structural breaks are formed in colluvium and residuum. Slope gradients range from 60 to 90 percent. Soils on these landforms are mostly moderately deep or deeper to bedrock, weakly developed and are loams dominated by gravel size rock fragments throughout. These soils are classified as Typic Ustochrepts and Typic Cryochrepts. Rock outcrop and associated talus occurs on about 40 to 50 percent or more over much of this landscape component. The amount of rock outcrop and scree is around 20 percent or less. The dominant potential natural vegetation is Douglas-fir series on higher energy aspects and subalpine fir and spruce series on more northerly aspects. Forested and non-forested scree occur throughout. This component represents 100 percent of this LTA.

Compiled by: Larry Laing, Helena National Forest

LTA34-331D
LTA34-M332D
LTA34-M332C

HIGH RELIEF MOUNTAIN SLOPES: VOLCANICS

Location: This LTA is located in the Highwood, Little Belt, and Crazy Mountains. It also occurs in the foothills of the Belt and Little Belt Mountains.

Acreage by Section

34-331D	6,622
34-M332D	15,602
34-M332C	233

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep mountain slopes composed of convex ridges and shoulders in complex with smooth surfaces. Parent materials include sandstone, granite, and basalt.

Accessory Characteristics: The primary soil is shallow to moderately deep very gravelly or stony loam or sandy loam. The vegetation is coniferous forest. Mean annual precipitation ranges from 46 to 76 centimeters (18 to 30 inches). The elevation range is 1830 to 2288 meters (6,000 to 7,500 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being dendritic. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of very steep mountain slopes.

These mountain slopes are formed in sandstone, granite and basalt. Slope gradient is greater than 60 percent. Soils on this landform are shallow to moderately deep, weakly developed and consists mainly of very gravelly or stony colluvial material. These soils are classified as Typic Cryochrepts. Typically 10 to 25 percent of this association consists of rock outcrop. The dominant potential vegetation is subalpine fir series with some scree. This component represents the entirety of this LTA.

Compiled by: Rich Saunders, Lewis and Clark National Forest
Revised by Larry Laing, Helena, and Lewis and Clark National Forests

LTA36-331D
LTA36-M332D
LTA36-M332C

HIGH RELIEF MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located throughout the Lewis and Clark National Forest except in the Little Snowy Mountains.

Acreage by Section

36-331D	764
36-M332D	12,477
36-M332C	13,447

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on very steep, unglaciated mountain slopes typically composed of convex ridges and shoulders in complex with smooth surfaces. Parent materials are non-carbonate and sedimentary.

Accessory Characteristics: The primary soils are shallow to moderately deep extremely gravelly loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 51 to 102 centimeters (20 to 40 inches). The elevation range of this LTA is 1829 to 2743 meters (6000 to 9000 feet). The dominant slopes have gradients of greater than 60 percent. This LTA is slightly dissected by streams with the dominant stream pattern being radial. Wetlands and lakes are virtually non-existent in this LTA.

LTA Components: This landtype association consists of convex ridges, and shoulders in complex with smooth surfaces. All of these landforms occur on non-carbonate sedimentary parent material.

The convex ridges and shoulders have slope gradient of 25 to greater than 60 percent. Soils on these landforms are shallow to moderately deep, poorly developed, and consist mainly of extremely gravelly sandy loam. The major soils are classified as Typic Cryochrept. Rock outcrop and talus occur on 75 percent of this unit. The dominant potential natural vegetation series is subalpine fir-whitebark pine.

Compiled by: Richard Saunders, Lewis and Clark National Forest

LTA43-331D
LTA43-M332D
LTA43-M332C
LTA43-M333C

STEEP GLACIATED MOUNTAIN SLOPES: CARBONATES

Location: This LTA is located mostly on the Rocky Mountain Front portion of the Lewis and Clark National Forest.

Acreage by Section

43-331D	624
43-M332D	12,878
43-M332C	158,089
43-M333C	235

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically occupied by fault escarpments (mostly in M332C), cirques, troughwalls, and ridges. The parent material is limestone.

Accessory Characteristics: The primary soils are Lithic Cryorthents and Cryochrepts. The vegetation is coniferous forest. Mean annual precipitation ranges from 76 to 127 centimeters (30 to 50 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). The dominant slope gradients are 70 to 90 percent. This LTA is moderately dissected by streams and the dominant drainage pattern is dendritic. Wetlands, lakes, and ponds are a minor component of this LTA.

LTA Components: This landtype association consists of steep west facing slopes, very steep glacial breaks, and rockland/scree on fault escarpments.

The steep west facing slopes are formed in limestone. These slopes have gradient ranging from 40 to 60 percent. Soils on these landscapes are shallow, poorly developed, and consist mainly of loam and flaggy gravel. These soils are classified as Lithic Cryorthents. Rock outcrop occurs on less than 15 percent of this landscape component. The dominant potential vegetation series are open growing wind deformed Douglas-fir, limber pine, and spruce on a scree habitat type. This component represents 30 percent of this LTA.

The very steep glacial breaks are formed in limestone. Slope gradients are mainly greater than 60 percent. The soil on this landscape is deep, poorly developed, and consist mainly of sandy loam and gravel. These soils are classified as Typic Cryochrepts. Rock outcrop and talus occur on seventy five percent of this landscape component. The dominant potential natural vegetation series is Douglas-fir. This component represents 30 percent of this LTA.

The rockland/scree component occurs on fault escarpments in limestone. Slopes are mainly greater than 60 percent. Soil on this landscape consists of sandy loam, loamy sand, gravel, and cobble. These materials are classified as scree. The dominant potential vegetation is subalpine fir-whitebark pine. This component represents 40 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA44-331D
LTA44-M332D
LTA44-M332C

STEEP GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is extensive throughout the Rocky Mountain Division on the Lewis and Clark Forest and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

44-331D	98
44-M332D	15,947
44-M332C	101,583

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occupies high elevation landscapes where alpine glaciation has occurred. It is typically composed of glacial cirque headwalls and rockland/scree on fault escarpments in Section M332C, and glacial cirques in Section M332D. The parent material is sandstone and/or shale.

Accessory Characteristics: The primary soils are deep extremely cobbly sandy loams and loams. The vegetation is coniferous forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1500 to 2896 meters (5000 to 9000 feet). The dominant slopes have gradients of 40 to greater than 60 percent. This landtype is moderately dissected by streams, with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This map unit consists of glacial cirques, rockland, and scree on fault escarpments

Glacial cirques are formed in sandstone and shale. Soils on these landforms are from very shallow to moderately deep, poorly developed, and consist mainly of sandy loam and angular cobble. The major soils are classified as Typic, Andic and Lithic Cryochrepts. Rock outcrop occurs on 5 to 15 percent of this landscape component. The dominant potential natural vegetation is subalpine fir and whitebark pine series. This component represents 60 percent of this unit.

Rockland occurs on a variety of non-carbonate rocks. This component is a miscellaneous landtype and is classified as scree. It does support some alpine fir and whitebark pine. This component represents 25 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest, and Dave Ruppert, Beaverhead-Deerlodge National Forest

LTA53-331D

GLACIATED MOUNTAIN SLOPES: SANDSTONES AND SHALES

Location: This LTA is located in the Rocky Mountain Front foothills on the Lewis and Clark National Forest.

Acreage by Section

53-331D	3,058

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs on an alpine glacial till landform which is typically composed of outwash benches, drift plastered trough walls, and hilly valley bottoms. Parent materials are sandstones and shales.

Accessory Characteristics: The primary soils are deep, very cobbly loams. The vegetation is subalpine forest. Mean annual precipitation ranges from 63 to 88 centimeters (25 to 35 inches). The elevation range of this LTA is 1524 to 1981 meters (5000 to 6500 feet). The dominant slopes have gradients of 10 to 40 percent. This landtype association is moderately dissected by streams with the dominant stream pattern being parallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of clayey glacial drift deposits, drift plastered trough walls, and hilly glaciated valleys.

The clayey glacial drift deposits are formed mainly in sandstone and shale material. Slope gradients range from 10 to 40 percent. The soils on these landforms are deep, weakly developed, skeletal loams. These soils are classified as Andic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation series is subalpine fir.

The drift plastered trough walls are formed mainly in sandstone and shale material. Slope gradients range from 25 to 40 percent. The soils on these landforms are deep, weakly developed, and loamy-skeletal. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape. The dominant potential natural vegetation series is Douglas-fir.

The hilly glaciated valleys are formed mainly in sandstone and shale. Slope gradients range from 10 to 25 percent. The soils on these landforms are moderately deep, weakly developed, clay loams with 35 to 50 percent gravel. These soils are classified as Argic Cryoborolls. Rock outcrop occurs on less than 5 percent of this LTA. The dominant natural vegetation series is rough fescue.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA64-331D
LTA64-M332Db

MOUNTAIN SLOPES AND RIDGES: VOLCANICS

Location: This LTA is located mostly in the Highwood and Castle mountain ranges in central Montana in the Missouri River Basin. Smaller amounts occur in the Little Belt, Snowy and Judith Mountains.

Acreage by Subsection

64-331D	26,813
64-M332Db	3,239

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountain slope landscape setting, which is typically composed of moderately steep to steep mountain slopes and valley sideslopes. Parent materials are latite, rhyolites, and shonkinites.

Accessory Characteristics: The primary soils are well drained, 20 to 60 inches deep, slightly acidic to neutral and loamy skeletal. Vegetation is a complex of grassland and lodgepole pine forest. Mean annual precipitation ranges from 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1371 to 1982 meters (4500 to 6500 feet). The dominant slopes have gradients of 25 to 60 percent. This LTA is well dissected by streams, with the dominant stream pattern being subparallel. Wetlands are a minor component of this LTA.

LTA Components: This landtype association consists of stream dissected mountain slopes.

Stream dissected mountain slopes are formed in colluvium derived from rhyolite, latite, and shonkinite parent materials. Slope gradients range from 25 to 60 percent. Soils on these landforms are weakly developed, 20 to 60 inches in depth; loam topsoils are 4 to 10 inches thick, subsoils are brown loam with 10 to 75 percent cobble. These soils are classified as Typic Cryochrepts. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is Douglas-fir at lower elevations, and subalpine fir at higher elevations.

Compiled by: Robin Strathy, Lewis and Clark National Forest

LTA68-331D
LTA68-M332D
LTA68-M332C

MOUNTAIN SLOPES AND RIDGES: SANDSTONES AND SHALES

Location: This LTA is located in the Little Belt Mountains and along the Rocky Mountain Front on the Lewis and Clark National Forest, and in the Elkhorn Mountains on the Beaverhead-Deerlodge Forest.

Acreage by Section

68-331D	8,549
68-M332D	336,244
68-M332C	80,557

Map Unit Setting and General Characteristics

Differentiating Characteristics: This LTA occurs in a mountain slope or ridge setting which is typically composed of stream dissected mountain slopes and ridges. Parent materials are sandstone and shale.

Accessory Characteristics: The primary soils are moderately deep, skeletal loamy sands and loams. The vegetation is a mosaic of subalpine fir and rough fescue series. Mean annual precipitation ranges from 36 to 89 centimeters (14 to 35 inches). The elevation range of this LTA is 1524 to 2438 meters (5000 to 8000 feet). This LTA is moderately dissected by streams with the dominant pattern being parallel. Wetlands are a minor component.

LTA Components: This landtype association consists of low relief ridges and slopes, and steep valley sideslopes.

The low relief ridges and slopes are formed in sandstone and shale. Slope gradients are from 10 to 40 percent. Soils on these landforms are moderately deep to deep, moderately well developed, extremely gravelly loams. These soils are classified as Typic and Argic Cryoborolls. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is rough fescue and subalpine fir. This component represents 55 percent of this LTA.

The steep valley sideslopes are formed in sandstone and shale. Slope gradients are from 40 to 60 percent. The soils are classified as Typic and Andic Cryochrepts in Subsections 331Da, 331Db, and 331Dc, M332Cb, M332Cd, M332Dc, and M332Dd; soils in subsection M332Dm are Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is subalpine fir. This component represents 30 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy, Lewis and Clark National Forest

LTA90-331D
LTA90-M332D
LTA90-M332C

MASS WASTED SLOPES: MIXED GEOLOGY

Location: This LTA is located primarily in the Little Belt and Big Snowy Mountain Ranges on the Lewis and Clark Forest.

Acreage by Section

90-331D	2,576
90-M332D	73,847
90-M332C	67,272

LTA Setting and General Characteristics:

Differentiating Characteristics: This LTA occurs in a mountainous landscape setting, which is typically composed of valley sideslopes and benchy lower valley slopes. The primary parent material is shale, but some undifferentiated material is also present.

Accessory Characteristics: The primary soils are deep, clayey and skeletal silt loams and silty clay loams. The vegetation is coniferous forest. Mean annual precipitation is 51 to 76 centimeters (20 to 30 inches). The elevation range of this LTA is 1350 to 2100 meters (4500 to 7000 feet). The dominant slopes have gradients of 10 to 40 percent. This LTA is moderately dissected, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of rotational slumps and mud flows, benchy lower valley slopes, and upper valley sideslopes. Rotational slumps and mud flows are formed shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep, weakly developed, and consist of mainly of loam, silt loam, and cobble. The major soils are classified as Typic Cryochrepts. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is subalpine fir. This component represents 55 percent of this LTA.

Benchy lower valley slopes are formed in shale. Slope gradients range from 10 to 40 percent. Soils on these landforms are moderately deep and deep, weakly developed, and consist of loam, silt loam and gravel. The major soils are classified as Typic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir. This component represents 30 percent of this LTA.

Upper valley sideslopes are formed in shale. Slope gradients range from 10 to 25 percent. Soils on these landforms shallow, moderately developed and consist mainly of loam and cobble. The major soils are classified as Mollic Cryoboralfs. Rock outcrop occurs on less than 15 percent of this LTA. The dominant potential natural vegetation is Douglas-fir. This component represents 15 percent of this LTA.

Compiled by: Richard Saunders and Robin Strathy Lewis and Clark National Forest

SECTION 331F NORTHWESTERN GREAT PLAINS

Only that portion of this Section which occurs in southeastern North Dakota is within the Northern Region of the Forest Service. This section includes gently sloping to rolling, moderately dissected shale plains. Bedrock consists of soft Cretaceous and Lower Tertiary non-marine sedimentary formations.

SECTION 331G POWDER RIVER BASIN

This Section occurs in southeast Montana and northeast Wyoming. This area includes gently rolling to steep dissected plains on the Missouri Plateau. Wide belts of steeply sloping badlands border a few of the larger river valleys. In places, flat-topped, steep sided buttes rise sharply above the surrounding plains. There are Cretaceous and Lower Tertiary non-marine sedimentary rocks. Glacial lake beds also occur.

LTA1-331F

LTA1-331G

PLAINS: SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in western North Dakota and northwest South Dakota on the Custer National Forest.

Acreage by Section

1-331F	946,770
1-331G	21,416

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a rolling plains landscape setting, which is typically composed of hills and swales. Parent materials are residuum underlain by shale, siltstone and sandstone.

Accessory Characteristics: The primary soils are shallow to deep, with moderately coarse to fine textures. The vegetation is a mosaic of prairie grasslands and shrubland. Mean annual precipitation ranges from 36 to 41cms (14 to 16 inches). The elevation range is 540 to 1000 meters (1770 to 3280 feet). The dominant slopes have gradients of 2 to 15 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of hills and swales.

Hills are formed in residuum. Slope gradients range from 2 to 15 percent. Soils on these landforms are shallow to deep, moderately developed, with moderately coarse to moderately fine textures. These soils are classified as Typic Ustorthents, Leptic Natriborolls, and Typic Argiborolls. The dominant potential natural vegetation is Western wheatgrass, needle and thread, little bluestem and prairie sandreed. This component represents 60 percent of this unit.

Swales are formed in residuum and alluvium. Slope gradients range from 2 to 15 percent. Soils on these landforms are shallow to deep, moderately developed, with moderately coarse to moderately fine textures. These soils are classified as Typic Ustorthents, Borollic Natrargids, and Typic Argiborolls. The dominant potential natural vegetation is western wheatgrass. Other communities include big bluestem and silver sagebrush, green ash, and western snowberry. This component represents 40 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA2-331F

GLACIATED PLAINS: SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in west central North Dakota on the Custer National Forest.

Acreage by Section

2-331F	32,403

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a gently undulating to rolling continental glacial till plain, which is typically composed of hills, and drainageways. Parent materials are glacial till underlain by shale, siltstone and sandstone.

Accessory Characteristics: The primary soils are shallow to deep, with medium textures. The vegetation is a mosaic of prairie grasslands and some shrublands. Mean annual precipitation ranges from 36 to 41cms. (14 to 16 inches). The elevation range is 560 to 750 meters (1835 to 2460 feet). The dominant slopes have gradients of 0 to 15 percent. This unit is slightly to moderately dissected by streams, with the dominant stream pattern being dendritic. Riparian areas and wetlands are a minor component of this unit.

LTA Components: This landtype association consists of hills and drainageways.

Hills are formed in glacial till. Slope gradients range from 2 to 25 percent. Soils on these landforms are shallow to deep, moderately developed, with medium and medium textures. These soils are classified as Entic Haploborolls, Typic Argiborolls, and Typic Ustorthents. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes Western wheatgrass, needle and thread, little bluestem, prairie sandreed. Skunkbrush, horizontal juniper may be found on steeper drier slopes. This component represents 60 percent of this unit.

Drainageways and swales are formed in glacial till. Slope gradients range from 0 to 9 percent. Soils on these landforms are shallow to deep, moderately developed, with medium and medium textures. These soils are classified as Entic Haploborolls, Typic Argiborolls, and Typic Ustorthents. The dominant potential natural vegetation is western wheatgrass series. Other communities include big bluestem and silver sagebrush, green ash, western snowberry and buffalo berry. This component represents 40 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA3-331F
LTA3-331G

DISSECTED PLAINS: SHALE, SILTSTONE, AND SANDSTONE

Location: This unit is located in western North Dakota, northwest South Dakota, and southeast Montana on the Custer National Forest.

Acreage by Section

3-331F	515,063
3-331G	53,589

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in gently sloping to rolling shale plains landscape setting, which is typically composed of hills, drainages and ridges. Parent materials are residuum underlain by sandstone, siltstone and shale.

Accessory Characteristics: The primary soils are shallow to deep, with coarse to medium textures. The vegetation is a mosaic of shrublands, and prairie grasslands. Mean annual precipitation ranges from 31 to 51cms (12 to 20 inches). The elevation range is 540 to 950 meters (1770 to 3120 feet). The dominant slopes have gradients of 6 to 50 percent. This unit is moderately to strongly dissected by streams, with the dominant stream pattern being dendritic with subparallel in some areas.

LTA Components: This landtype association consists of hills, drainages, and knobs.

Hills are formed in residuum. Slope gradients range from 6 to 50 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with moderately coarse to medium textures. These soils are classified as Typic Ustorthents, Typic Argiborolls, Typic Haploborolls, Typic Ustipsamments, and badlands. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes Western wheatgrass, needle and thread, little bluestem, prairie sandreed. Skunkbrush, horizontal juniper, green ash, rocky mountain juniper, and shrubby cinquefoil may be found on steeper slopes. This component represents 40 percent of this unit.

Drainages are formed in residuum and alluvium. Slope gradients range from 2 to 25 percent. Soils on these landforms are moderately deep, moderately developed, with medium and moderately coarse textures. These soils are classified as Typic Ustorthents, Typic Argiborolls, and Typic Haploborolls. The dominant potential natural vegetation is Western wheatgrass. Other communities include big bluestem, silver sagebrush, green ash, western snowberry buffalo berry, silver sagebrush. This component represents 35 percent of this unit.

Knobs are formed in residuum. Slope gradients range from 8 to 35 percent. Soils on these landforms are shallow to deep, moderately developed, with coarse to medium textures. These soils are classified as Typic Ustorthents, Borollic Natrargids, Typic Ustipsamments, Typic Haploborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation on drier slopes includes big sagebrush, shadscale, greasewood and skunkbrush. On mesic slopes, buffalo berry, horizontal juniper, western wheatgrass, needle and thread, green ash and rocky mountain juniper communities are found. This component represents 25 percent of this unit.
Compiled by: John R. Lane, Custer National Forest

LTA4-331F

GLACIATED DISSECTED PLAINS: SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in west central North Dakota on the Custer National Forest.

Acreage by Section

4-331F 27,111

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a high relief continental glacial till plains landscape setting, which is typically composed of hillsides, and drainageways. Parent materials are glacial till and residuum underlain by sandstone, siltstone and shale.

Accessory Characteristics: The primary soils are shallow to deep, with medium textures. The vegetation is a mosaic of prairie grasslands. Mean annual precipitation ranges from 36 to 41 cms (14 to 16 inches). The elevation range is 570 to 740 meters (1870 to 2425 feet). The dominant slopes have gradients of 6 to 25 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic. Wetlands and riparian areas are a minor component of this unit.

LTA Components: This landtype association consists of hillsides and drainages.

Hillsides are formed in glacial till. Slope gradients range from 6 to 25 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with medium and medium textures. These soils are classified as Typic Argiborolls, Entic Haploborolls and Typic Ustorthents. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes western wheatgrass, needle and thread, little bluestem, prairie sandreed. Skunkbrush, horizontal juniper, green ash, rocky mountain juniper, and shrubby cinquefoil may be found on steeper slopes. This component represents 60 percent of this unit.

Drainageways are formed in glacial till and residuum. Slope gradients range from 6 to 40 percent. Soils on these landforms are shallow to deep, moderately developed, with medium textures. These soils are classified as Entic Haploborolls, and Typic Ustorthents. The dominant potential natural vegetation is western wheatgrass. Other communities include big bluestem and silver sagebrush, green ash, western snowberry and buffalo berry, and silver sagebrush. This component represents 40 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA5-331F
LTA5-331G

BADLANDS: SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in western North Dakota and northwest South Dakota on the Custer National Forest.

Acreage by Section

5-331F	783,355
5-331G	429

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a rugged, deeply eroded dissected shale plains landscape setting, which is typically composed of knobs, hillsides, and entrenched channels. Parent materials are residuum and alluvium underlain by shale, siltstone and sandstone.

Accessory Characteristics: The primary soils are shallow to moderately deep with moderately coarse to moderately fine textures. The vegetation is a mosaic of prairie grasslands, shrubland, and coniferous forest. Mean annual precipitation ranges from 36 to 41 cms (14 to 16 inches). The elevation range is 580 to 960 meters (1900 to 3150 feet). The dominant slopes have gradients of 6 to greater than 40 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of knobs, hillsides and entrenched channels.

Knobs are formed in residuum. Slope gradients range from 6 to 50 percent. Soils on these landforms are shallow to deep, moderately developed, with coarse to medium textures. These soils are classified as Typic Haploborolls, Typic Ustorthents, and Leptic Natriborolls. Rock outcrop occurs on about 40 percent of this landscape component. The dominant potential natural vegetation on drier slopes includes big sagebrush, shadscale, greasewood and skunkbrush. On mesic slopes, buffalo berry, horizontal juniper, western wheatgrass, needle and thread, green ash and rocky mountain juniper communities are found. This component represents 35 percent of this unit.

Hillsides are formed in residuum. Slope gradients range from 6 to 50 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with coarse to medium textures. These soils are classified as Typic Ustorthents, Typic Haploborolls, and Typic Ustipsamments. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation on drier slopes includes big sagebrush, shadscale, greasewood and skunkbrush. On mesic slopes, buffalo berry, horizontal juniper, western wheatgrass, needle and thread, green ash and rocky mountain juniper, western wheatgrass, little bluestem and prairie sandreed communities are found. This component represents 35 percent of this unit.

Entrenched channels are formed in residuum and alluvium. Slope gradients range from 6 to 30 percent. Soils on these landforms are shallow to deep, moderately developed, with medium to coarse textures. These soils are classified as Typic Haploborolls, Typic Ustorthents, and Leptic Natriborolls. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation includes silver sagebrush, western snowberry, green ash, western wheatgrass, buffalo berry, and inland saltgrass. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA6-331F
LTA6-331G

ERODED UPLANDS: VOLCANIC TUFFS, SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in southeast Montana and western South Dakota on the Custer National Forest.

Acreage by Section

6-331F	116,337
6-331G	190,412

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a undulating to steep dissected shale plains landscape setting, which is typically composed of ridges, plateaus, hillsides and rimrocks. Parent materials are residuum, and colluvium underlain by volcanic tuffs, shales, siltstones and sandstones.

Accessory Characteristics: The primary soils are shallow to deep, with moderately coarse to moderately fine textures. The vegetation is a mosaic of coniferous forest, prairie grassland, and deciduous forest. Mean annual precipitation ranges from 31 to 51 cms (12 to 20 inches). The elevation range is 900 to 1400 meters (2950 to 4600 feet). The dominant slopes have gradients of 15 to 60 percent. This unit is moderately to strongly dissected by streams, with the dominant stream pattern being dendritic and parallel in the southern Ekalaka Hills.

LTA Components: This landtype association consists of ridges, plateaus, hillsides, and rimrocks.

Ridges are formed in colluvium and residuum. Slope gradients range from 8 to 70 percent. Soils on these landforms are shallow to deep, poorly developed, with very gravelly moderately coarse to moderately fine textures. These soils are classified as Typic Ustochrepts, Typic Ustorthents, and Mollic Eutroboralfs. Rock outcrop occurs on about 25 percent of this landscape component. The dominant potential natural vegetation on ridge tops are needle and thread, Idaho fescue, and western wheatgrass. Ponderosa pine, green ash and rocky mountain juniper are found on steep sideslopes. This component represents 30 percent of this unit.

Plateaus are formed in colluvium and residuum. Slope gradients range from 4 to 15 percent. Soils on these landforms are shallow to deep, poorly to moderately developed, with moderately coarse to moderately fine textures. These soils are classified as Mollic Eutroboralfs, Typic Haploborolls, and Typic Ustorthents. Rock outcrop occurs on about 5 percent of this landscape component. The dominant potential natural vegetation is needle and thread, Idaho fescue, western wheatgrass and big sagebrush. Little bluestem and prairie sandreed are inclusions which occur on shallow sites or sites with coarse textured soils. This component represents 25 percent of this unit.

Hillsides are formed in colluvium and residuum. Slope gradients range from 6 to 60 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with coarse to very gravelly moderately fine textures. These soils are classified as Lithic Ustorthents, Mollic Eutroboralfs, and Typic Eutroboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is ponderosa pine, green ash and rocky mountain juniper on steep sideslopes. Other series found include skunkbrush, horizontal juniper, bluebunch wheatgrass and little bluestem.

This component represents 25 percent of this unit.

Rimrocks are formed in colluvium and residuum. Slope gradients range from 15 to 60 percent. Soils on these landforms are shallow to moderately deep, weakly to moderately developed, with coarse to moderately fine textures. These soils are classified as Ustic Torriorthents, Typic Eutroboralfs, and Typic Ustorthents. Rock outcrop occurs on about 40 percent of this landscape component. This component is relatively non-vegetated, but includes patches of ponderosa pine, rocky mountain juniper and skunkbrush. This component represents about 20 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA7-331F
LTA7-331G

EROSIONAL PLATEAUS AND BUTTES: SHALES, SILTSTONES, AND SANDSTONES

Location: This unit is located in western North Dakota, northwest South Dakota and southeast Montana on the Custer National Forest.

Acreage by Section

7-331F	22,819
7-331G	161,941

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a rolling to steep dissected shale plains landscape setting, which is typically composed of buttes, plateaus, ridges and channels. Parent materials are residuum underlain by shale, siltstone and sandstone.

Accessory Characteristics: The primary soils are shallow to deep, with coarse to moderately fine textures. The vegetation is a mosaic of prairie grasslands. Mean annual precipitation ranges from 30 to 51 cms. (12 to 20 inches). The elevation range is 820 to 1020 meters (2690 to 3345 feet). The dominant slopes have gradients of 2 to greater than 60 percent. This unit is moderately to strongly dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of buttes, ridges and plateaus.

Buttes are formed in residual sandstone and shale. Slope gradients range from 2 to greater than 60 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with coarse to moderately fine textures. These soils are classified as Typic Haploborolls, Typic Ustipsamments, and Typic Ustorthents. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation includes needle and thread, western wheatgrass, blue bunch wheatgrass, skunkbrush, little bluestem, green ash, rocky mountain juniper, ponderosa pine and buffalo berry. This component represents 35 percent of this unit.

Ridges are formed in residual sandstone and shale. Slope gradients range from 6 to 40 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with coarse to moderately fine textures. These soils are classified as Leptic Natriborolls, Typic Haploborolls, Typic Ustipsamments. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential natural vegetation on ridge tops are needle and thread, Idaho fescue and western wheatgrass. Ponderosa pine, green ash and rocky mountain juniper are found on steep sideslopes. This component represents 30 percent of this unit.

Plateaus are formed in loamy residuum, and colluvium. Slope gradients range from 0 to 10 percent. Soils in these landforms are shallow to deep, moderately developed, with medium and moderately fine textures. These soils are classified as Typic Argiborolls, Lithic Ustorthents, Typic Natriborolls, and Entic Haploborolls. Rock outcrop occurs on about 15 percent of this landscape component. The dominant potential natural vegetation includes needle and thread, Idaho fescue, western wheatgrass and big sagebrush. Ponderosa pine occurs on steeper slopes and heads of drainages. Little bluestem and prairie sandreed are inclusions which occur on shallow sites or sites with coarse textured soils. This component represents 35 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA10-331F

VALLEYS: RECENT COARSE ALLUVIUM

Location: This unit is located in western North Dakota on the Custer National Forest.

Acreage by Section

10-331F	5,917

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a undulating to rolling continental glacial till plains landscape setting, which is typically composed of stream channels, flood plains and terraces. Parent materials are fine to coarse alluvium and glacial till underlain by shale, siltstone, and sandstone.

Accessory Characteristics: The primary soils are deep, with medium textures. The vegetation is a mosaic of prairie grasslands and shrublands. Mean annual precipitation ranges from 31 to 41 cms. (14 to 16 inches). The elevation range is 550 to 600 meters (1805 to 1970 feet). The dominant slopes have gradients of 0 to 8 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of stream channels, flood plains and terraces.

Stream channels are formed in alluvium. Slope gradients range from 0 to 6 percent. Soils on these landforms are deep, weakly to moderately developed, with coarse to medium textures. These soils are classified as Ustic Torrifluvents, and Typic Ustifluvents. The dominant potential natural vegetation includes green ash, plains cottonwood, western snowberry, Baltic rush, inland saltgrass, Alkali grass and prairie cordgrass. This component represents 35 percent of this unit.

Flood plains are formed in alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, weakly developed, with coarse to medium textures. These soils are classified as Ustic Torrifluvents, and Typic Ustifluvents. The dominant potential natural vegetation includes western wheatgrass, silver sagebrush, western snowberry, green ash, plains cottonwood, inland saltgrass, and Alkali grass. This component represents 35 percent of this unit.

Terraces are formed in alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, moderately developed, with coarse to medium textures. These soils are classified as Ustic Torrifluvents, Typic Argiborolls, and Typic Ustifluvents. The dominant potential natural vegetation includes western wheatgrass, silver sagebrush, western snowberry, inland saltgrass, and greasewood. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA12-331F

VALLEYS: OUTWASH OR OLDER COARSE ALLUVIAL DEPOSITS

Location: This unit is located in western North Dakota and northwestern South Dakota on the Custer National Forest.

Acreage by Section

12-331F	50,843

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a rolling to steep dissected shale plains landscape setting, which is typically composed of terraces. Parent materials are alluvium underlain by older coarser alluvium and shale and sandstone.

Accessory Characteristics: The primary soils are moderately deep to deep, with medium and moderately coarse textures. The vegetation is a mosaic of prairie grasslands. Mean annual precipitation ranges from 36 to 41 cms. (14 to 16 inches). The elevation range is 560 to 1030 meters (1840 to 3380 feet). The dominant slopes have gradients of 0 to 6 percent. This unit is weakly dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of terraces.

Terraces are formed in alluvium. Slope gradients range from 0 to 6 percent. Soils on these landforms are moderately deep to deep, moderately developed, with moderately fine to moderately coarse textures. These soils are classified as Typic Argiborolls, and Typic Haploborolls. The dominant potential natural vegetation includes western wheatgrass, silver sagebrush, western snowberry, inland saltgrass, and greasewood. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA14-331F
LTA14-331G

VALLEYS: RECENT FINE ALLUVIUM

Location: This LTA is located in west central North Dakota, western South Dakota, and eastern Montana on the Custer National Forest.

Acreage by Section

14-331F	206,152
14-331G	27,147

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a gently sloping to steep dissected plains landscape setting, which is typically composed of stream channels, flood plains and terraces. Parent materials are fine to coarse alluvium underlain by shales and sandstones.

Accessory Characteristics: The primary soils are deep, with coarse to fine textures. The vegetation is a mosaic of deciduous forest, shrublands, and prairie grasslands. Mean annual precipitation ranges from 31 to 51cms. (12 to 20 inches). The elevation range is 540 to 900 meters (1770 to 2950 feet). The dominant slopes have gradients of 0 to 8 percent. This unit is slightly dissected by streams, with the dominant stream pattern being dendritic. Wetlands are a minor component of this unit.

LTA Components: This landtype association consists of stream channels, flood plains and terraces.

Stream channels are formed in alluvium. Slope gradients range from 0 to 4 percent. Soils on these landforms are deep, moderately developed, with coarse to fine textures. These soils are classified as Typic Ustifluvents, Ustic Torrifluvents, and Fluvaquents. The dominant potential natural vegetation includes green ash, plains cottonwood, western snowberry, baltic rush, inland saltgrass, Alkali grass and prairie cordgrass. This component represents 30 percent of this unit.

Flood plains are formed in alluvium. Slope gradients range from 0 to 10 percent. Soils on these landforms are deep, moderately developed, with coarse to fine textures. These soils are classified as Typic Ustifluvents, Ustic Torrifluvents, Typic Argiborolls, and Fluvaquents. The dominant potential natural vegetation includes western wheatgrass, silver sagebrush, western snowberry, green ash, plains cottonwood, inland saltgrass and greasewood. Willow occurs in bands along stream banks. This component represents 35 percent of this unit.

Terraces are formed in alluvium. Slope gradients range from 0 to 8 percent. Soils on these landforms are deep, strongly developed, with coarse to medium textures. These soils are classified as Typic Haploborolls, Typic Ustifluvents, Ustollic Haplargids, and Ustic Torrifluvents. The dominant potential natural vegetation includes western wheatgrass, silver sagebrush, western snowberry, inland saltgrass, greasewood, green ash, and plains cottonwood. This component represents 35 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA25-331F

BREAKS: SANDSTONES AND SHALES

Location: This unit is located in southwestern North Dakota on the Custer National Forest.

Acreage by Section

25-331F	25,390

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a undulating to rolling continental glacial till plains landscape setting, which is typically composed of stream breaklands and structural breaklands. Parent materials are weathered shale, siltstone, sandstone and glacial till underlain by shale, siltstone and sandstone.

Accessory Characteristics: The primary soils are shallow to deep, with medium textures. The vegetation is a mosaic of prairie grasslands. Mean annual precipitation ranges from 36 to 51 cms. (14 to 20 inches). The elevation range is 560 to 700 meters (1835 to 2300 feet). The dominant slopes have gradients of 6 to 30 percent. This unit is strongly dissected by streams, with the dominant stream pattern being dendritic and parallel.

LTA Components: This landtype association consists of stream breaks and structural breaks.

Stream breaks are formed in glacial till and residuum. Slope gradients range from 6 to 40 percent. Soils on these landforms are shallow to deep, moderately developed, with medium and moderately fine textures. These soils are classified as Entic Haploborolls, Typic Ustorthents, and rock outcrop. Rock outcrop occurs on about 35 percent of this landscape component. The dominant potential natural vegetation includes big sagebrush, shadscale, skunkbrush, rocky mountain juniper, green ash, needle and thread, western wheatgrass, little bluestem and horizontal juniper. This component represents 70 percent of this unit.

Structural breaks are formed in glacial till. Slope gradients range from 6 to 40 percent. Soils on these landforms are shallow to moderately deep, moderately developed, with medium and moderately fine textures. These soils are classified as Typic Argiborolls, Entic Haploborolls, and Typic Ustorthents. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation includes big sagebrush, shadscale, skunkbrush, rocky mountain juniper, green ash, needle and thread, western wheatgrass, little bluestem and horizontal juniper. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA25-331G

BREAKS, SILTSTONES AND CLAYSTONES

Location: This unit is located in southeast Montana on the Custer National Forest.

Acreage by Section

25-331G	50,254

LTA Setting and General Characteristics

Differentiating Characteristics: This unit occurs in a sloping to steep dissected shale plains landscape setting, which is typically composed of stream breaklands. Parent materials are residuum and colluvium underlain by siltstones and claystones.

Accessory Characteristics: The primary soils are shallow to deep, with medium to very gravelly medium textures. The vegetation is a mosaic of prairie grasslands and coniferous forest. Mean annual precipitation ranges from 31 to 51 cms (12 to 20 inches). The elevation range is 760 to 915 meters (2500 to 3000 feet). The dominant slopes have gradients greater than 25 percent. This unit is strongly dissected by streams, with the dominant stream pattern being dendritic and parallel.

LTA Components: This landtype association consists of stream breaks.

Stream breaks are formed in loamy residuum, and colluvium. Slope gradients range from 15 to 60 percent. Soils in these landforms are shallow to deep, moderately developed, with medium and medium to very gravelly medium textures. These soils are classified as Typic Haploborolls, Lithic Ustorthents, Typic Ustorthents, and Ustic Torriorthents. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, shadscale, skunkbrush, rocky mountain juniper, green ash, ponderosa pine, needle and thread, western wheatgrass, little bluestem and horizontal juniper. This component represents 100 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

Section M331B Bighorn Mountains

Section 342A Bighorn Basin

This Section occurs in southcentral Montana and northcentral Wyoming. Only the Pryor Mountains, the northern portion of the Bighorn Mountains, are in the Northern Region. These mountains consist mainly of limestones and shales. Included with this Section is a small acreage in the Bighorn Basin (Section 342A). Due to the scale differences between the Section and LTA mapping, some LTAs mapped in M331B have acreage shown in 342A.

LTA27-M331B

LTA27-342A

BREAKS: CARBONATES

Location: This unit is located mostly in the Pryor Mountains of south central Montana on the Custer National Forest.

Acreage by Section

27-M331B	21,388
27-342A	1,069

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a dissected mountain landscape setting, which is typically composed of structural and stream breaks. Parent materials are residuum, and colluvium underlain by limestone and shale.

Accessory Characteristics: The primary soils are shallow to deep, with medium to gravelly medium and moderately fine textures. The vegetation is a mosaic of coniferous forest and mountain grassland. Mean annual precipitation ranges from 38 to 51 cms (15 to 20 inches). The elevation range is 1500 to 2700 meters (4920 to 8860 feet). The dominant slopes have gradients of 15 to >90 percent. This unit is moderately dissected by streams with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of structural breaks and stream breaks.

Structural breaks are formed in residuum and colluvium. Slope gradients range from 45 to 90 percent. Soils on these landforms are shallow to deep, weakly to strongly developed, medium to very gravelly medium textures and rock outcrop. These soils are classified as Calcic Cryoborolls, Typic Cryoboralfs, and Typic Cryoborolls. Rock outcrop occurs on about 30 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir, Douglas-fir, and Engelmann spruce. This component represents 60 percent of this unit.

Stream breaks are formed in colluvium and residuum. Slope gradients range from 15 to greater than 90 percent. Soils on these landforms are shallow to deep, weakly to strongly developed, medium to gravelly medium textures and rock outcrop. These soils are classified as Lithic Cryoborolls, Calcic Cryoborolls, and Typic Cryoboralfs. Rock outcrop occurs on about 40 percent of this landscape component. The dominant potential natural vegetation includes subalpine fir, Douglas-fir, and Engelmann spruce, and Idaho fescue and prairie smoke. This component represents 40 percent of this unit.
Compiled by: John R. Lane, Custer National Forest

LTA66-M331B
LTA66-342A

MOUNTAIN SLOPES AND RIDGES: CARBONATES

Location: This unit is located mostly in the Pryor Mountains of south central Montana on the Custer National Forest.

Acreage by Section

66-M331B	52,103
66-342A	2,524

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a mountain landscape setting dissected by streams, which is typically composed of mountain dipslopes, benches, and ridges. Parent materials are gravelly and cobbly alluvium and colluvium, and channery and gravelly residuum underlain by Madison limestone.

Accessory Characteristics: The primary soils are shallow to deep, with medium and fine textures. The vegetation is a mosaic of shrublands, and mountain grasslands. Mean annual precipitation ranges from 38 to 48cms (15 to 19 inches). The elevation range is 1160 to 2713 meters (3800 to 8900 feet). The dominant slopes have gradients of 4 to 45 percent. This unit is moderately to strongly dissected by streams with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of dipslopes, benches, and ridges.

Dipslopes are formed in colluvial and residual limestone and sandstone. Slope gradients range from 8 to 70 percent. Soils on these landforms are shallow to deep, weakly to strongly developed, medium and gravelly medium textures. These soils are classified as Lithic, Calcic, Typic and Vertic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes big sagebrush and Idaho fescue for the non-forested areas and Douglas-fir, and limber pine for the forested areas. This component represents 70 percent of this unit.

Benches are formed in colluvial, residual and alluvial limestone and sandstone materials. Slope gradients range from 2 to 25 percent. Soils on these landforms are shallow to deep, moderately to strongly developed with medium and gravelly medium textures. These soils are classified as Ustollic Calciorthids, and Typic Ustorthents. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is mountain sagebrush, Idaho fescue, and Douglas-fir. This component represents about 15 percent of this unit.

Ridges are formed in residuum. Slope gradients range from 8 to 25 percent. Some of these ridges at the higher elevations exhibit frost churned features. Soils on these landforms are shallow to deep, poorly to strongly developed, with medium to very gravelly moderately fine textures. These soils are classified as Lithic Cryoborolls, Calcic Cryoborolls, and Vertic Cryoborolls. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation is big sagebrush, Idaho fescue, and alpine fir. This component represents about 15 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

LTA92-M331B

COLLUVIAL SLOPES: MIXED GEOLOGY

Location: This unit is located in the Pryor Mountains of south central Montana on the Custer National Forest.

Acreage by Section

92-M331B 879

LTA Setting and General Characteristics

Differentiating Characteristics: This map unit occurs in a dissected mountain landscape setting, which is typically composed of mountain footslopes and landslide deposits. Parent materials are residuum, colluvium and landslide deposits underlain by shale, limestone and sandstone.

Accessory Characteristics: The primary soils are shallow to deep, with channery to stony medium and moderately fine textures. The vegetation is a mosaic of coniferous forest, shrublands and mountain grasslands. Mean annual precipitation ranges from 15 to 51 cms (6 to 20 inches). The elevation range is 1300 to 2000 meters (4260 to 6560 feet). The dominant slopes have gradients of 15 to greater than 45 percent. This unit is moderately dissected by streams, with the dominant stream pattern being dendritic.

LTA Components: This landtype association consists of mountain footslopes and landslide deposits.

Mountain footslopes are formed in residuum and colluvium. Slope gradients range from 15 to greater than 45 percent. Soils on these landforms are shallow to deep, weakly to strongly developed, with medium to gravelly medium textures. These soils are classified as Calcic Cryoborolls, Lithic Calciborolls, and rock outcrop. Rock outcrop occurs on about 20 percent of this landscape component. The dominant potential natural vegetation includes shrubby cinquefoil and king fescue. This component represents 70 percent of this unit.

Landslide deposits are formed in shale and limestone. Slope gradients range from 15 to greater than 45 percent. Soils on these landforms are shallow to deep, weakly to strongly developed, with gravelly to stony medium textures. These soils are classified as rock outcrop, Lithic Cryoborolls, Calcic Cryoborolls, Typic Cryoborolls, and Typic Cryoboralfs. Rock outcrop occurs on about 10 percent of this landscape component. The dominant potential natural vegetation includes Idaho fescue, western wheatgrass and Douglas-fir. This component represents 30 percent of this unit.

Compiled by: John R. Lane, Custer National Forest

Appendix A

THE NATIONAL HIERARCHY OF ECOLOGICAL UNITS

This LTA mapping report refers to several levels of the National Hierarchical Framework of Ecological Units (ECOMAP 1993): Sections, Subsections, Landtype Associations and Landtypes. To help the reader understand these levels the following is an excerpt from the 1993 paper. Readers wanting more information and the references for the paper should consult that document.

The National Hierarchical Framework of Ecological Units is a regionalization, classification and mapping system that provides a systematic method for classifying and mapping areas of the Earth based on associations of ecological factors at different geographic scales.

Ecological types are classified and ecological units are mapped based on associations of those biotic and environmental factors that directly affect or indirectly express energy, moisture, and nutrient gradients which regulate the structure and function of ecosystems. These factors include climate, physiography, water, soils, air, hydrology, and potential natural communities. Ecological unit maps can be coupled with inventories of existing vegetation, air quality, aquatic systems, wildlife, and human elements to characterize complexes of life and environment, or ecosystems.

Ecological Unit Design

The primary purpose for delineating ecological units is to display land and water areas at different levels of resolution that have similar capabilities and potentials for management. Ecological Units are designed to exhibit similar patterns in: (1) potential natural communities, (2) soils, (3) hydrologic function, (4) landform and topography, (5) lithology, (6) climate, (7) air quality and (8) natural processes for cycling plant biomass and nutrients (e.g. succession, productivity, fire regimes).

Climate, as modified by topography, is the dominant criteria at the upper levels of the hierarchy. Other factors, such as geomorphic process, soils and potential natural communities take on equal or greater importance than climate at lower levels.

Underlying principles

Ecosystems exist at many spatial scales, from the global ecosphere down to regions of microbial activity. The level of discernible detail, the number of factors comprising ecosystems, and the number of variables used to characterize these factors progressively increase at finer scales. Hence the data and analysis requirements, and investments for ecosystem classification and mapping also increase for finer scaled activities.

The structure and function of ecosystems are largely regulated along energy, moisture, nutrient, and disturbance gradients. These gradients are affected by climate, physiography, soils, hydrology, flora, and fauna. While the association of these factors is all important in defining ecosystems, all factors are not equally important at all spatial scales. At coarse scales, the important factors are largely abiotic, while at finer scales both biotic and abiotic factors are important. Ecosystems are conceptualized as occurring in a nested geographic arrangement, with many smaller ecosystems embedded in larger ones.

At global, continental, and regional scales, ecosystem patterns correspond with climatic regions, which change mainly due to latitudinal, orographic, and maritime influences. Within climatic regions, physiography or landforms modify macroclimate, and affect the movement of organisms, the flow and orientation of watersheds, and the frequency and spatial pattern of disturbance by fire and wind. Within climatic-physiographic regions, water,

plants, animals, soils, and topography interact to form ecosystems at Land Unit scales.

Classification Framework

The following is an overview of the differentiating criteria used in the development of the ecological units.

Ecoregion: At the Ecoregion scale, ecological units are recognized by differences in global, continental, and regional climatic regimes and gross physiography. The basic assumption is that climate governs energy and moisture gradients, thereby acting as the primary control over more localized ecosystems. Three levels of Ecoregions are identified in the hierarchy: domains, divisions and provinces. Each LTA includes the domain, division and province modifier as a label attribute. The reference (ECOMAP, 1993) can be consulted for details about these levels.

Subregion: Subregions are characterized by combinations of climate, geomorphic process, topography, and stratigraphy that influence moisture availability and exposure to radiant solar energy, which in turn directly control hydrologic function, soil-forming processes, and potential plant community distributions. Sections and Subsections are the two ecological units mapped at this scale.

Section: Broad areas of similar geomorphic process, stratigraphy, geologic origin, drainage networks, topography, and regional climate. Such areas are often inferred by relating geologic maps to potential natural vegetation "series" groupings. Boundaries of some Sections approximate geomorphic provinces as recognized by geologists. Section names generally describe the predominant physiographic feature upon which the ecological unit delineation is based, such as Idaho Batholith, Yellowstone Highlands and Northern Rockies. In the Northern Region these units were mapped at a scale of 1:1,000,000

Subsections: Smaller areas of Sections with similar surficial geology, lithology, geomorphic process, soil groups, subregional climate, and potential natural communities. Names of Subsections are usually derived from geologic features, such as Upper Yellowstone Valley, Montana Glaciated Plains, and Clearwater Mountains and Breaks. Mapping of these units was done at a scale of 1:500,000.

Landscape Scale: At the Landscape scale, ecological units are defined by general topography, geomorphic process, surficial geology, soil and potential natural community patterns and local climate. These factors affect biotic distributions, hydrologic function, natural disturbance regimes and general land use. Local landform patterns become apparent at this level in the hierarchy, and differences among units are usually obvious to on-the-ground observers. At this level, terrestrial features and processes may also have a strong influence on ecological characteristics of aquatic habitats. Landtype Association ecological units represent this scale in the hierarchy.

Landtype Associations: Groupings of Landtypes or subdivisions of Subsections based upon similarities in geomorphic process, geologic rock types, soil complexes, stream types, lakes, wetlands, and series, subseries, or plant association vegetation communities. A number of different groupings of landtypes or subdivisions of Subsections are possible depending upon the purpose of the landtype associations. At the Landtype Association level predictable and repeatable units are mapped, using the delineation criteria that best fits the interpretive need. Region 1 chose to first develop a consistent set of geomorphic LTAs for the purpose of providing essential data needed in watershed characterization and planning. Names of Landtype Associations, as mapped in the Northern Region are combinations of landforms and geologic materials, such as Steep Glaciated Lands: Granitics.

Land Unit Scale: At the basic Land Unit scale, ecological units are designed and mapped in the field based on properties of local topography, rock types, soils, and vegetation. These factors influence the structure and composition of plant communities, hydrologic function, and basic land capability. Landtypes and Landtype Phases are the ecological units mapped at this scale.

Landtypes: Subdivisions of Landtype Associations or groupings of Landtype Phases based on similarities in soils, landform, rock type, geomorphic process and plant associations. The form of land surfaces influence hydrologic function (e.g., drainage density, dissection relief) and therefore are often used to delineate different landtypes in mountainous terrain. In the Northern Region landtype mapping has been done at a scale of 1:24,000 and corresponds with Order III NCSS Soil Survey information.

Appendix B

GEOMORPHIC OVERVIEW OF THE NORTHERN REGION

The repeatable patterns of landtype associations occur across a large complex of landscapes which includes portions of both the Rocky Mountains and the Great Plains. While the focus of this report is on the mapping of landtype associations, it is useful to first obtain a "big picture" perspective of the geomorphic units that are distinct at the regional scale. These landscape settings are characterized using the same types of criteria (landforms and geologic materials) as the landtype associations, however they are much larger, distinct geographic units.

Listed below are brief descriptions for the following seventeen distinct geomorphic environments found in the Northern Region (see Figure 82). The descriptions emphasize the geologic processes which have created these areas and the landforms and geologic materials occurring in each.

- Pryor Mountains
- Yellowstone Volcanic Plateau
- Beartooth Plateau
- Non Glaciated Plains
- Northern Glaciated Plains
- Rocky Mountain/Beartooth Front
- Central Montana Island Mountains
- Southwest Montana Mountains and Valleys
- Alpine Glaciated Metasedimentary Mountains
- Continental Glaciated Mountains
- Metasedimentary Mountains
- Columbia River Basalts
- Idaho Batholith Uplands
- Idaho Canyon Lands
- Badlands and Breaklands
- Prairie Potholes
- Red River Valley

Pryor Mountains

The Pryors are the northern nose of the Bighorn mountains of Wyoming. They are cut off by the antecedent gorge of the Bighorn River. Structural features include similar block faulting in a broad gentle uplift with minimal deformation on top with steeply dipping sediments draped up the sides. There is an east-west fault that divides the Pryors into two styles of landscape. To the north, the Cretaceous sediments are exposed in rolling hills of bentonitic shales with some areas of badlands. To the south, the massive Paleozoic limestones dominate the landscapes with high cliffs and large steep walled canyons.

Yellowstone Volcanic Plateau

The Yellowstone Volcanic plateau is a complex landscape shaped by glaciation and dominated by three main geologic types. The ash-dominated volcanics result in rolling, rounded landforms with few outcrops. Where oversteepened by glaciation or erosion they are very slide prone and indeed there are numerous very large slides in this material. The flow dominated volcanics are rockier and in many areas very susceptible to glacial plucking in the cirques, resulting in large amphitheater-like cirques at drainage heads. The Archean rocks preserve the "ice just melted look", resulting in rugged, spectacular landscapes with numerous horns and aretes.

Beartooth Plateau

This landscape is defined by fault blocks that raise it to the highest average elevation in the region. The core of the plateau is very resistant old rocks dated at 4 billion years. There are a few places where the overlying sedimentary rocks can still be seen. There are large areas in the southwest where ash dominated volcanics cover these old rocks. A special case is the Stillwater Complex which outcrops along the northern front. This is a layered intrusive body of unusually mafic rocks that host the only U.S. platinum group metal mines. Joint control of drainages and lakes at intersections is very dominant in the portions underlain by crystalline rocks. Many of these were enlarged in spectacular fashion by glaciation. Indeed a few small glaciers remain in this landscape. Grasshopper Glacier indicates that as late as 300 years ago there were swarms of locusts at this elevation in late summer. Another feature of note are the various "plateaus" or high elevation erosional surfaces preserved. These large broad ridgetops at high altitude show examples of most types of glacial and periglacial landforms. Till and talus are very abundant. The horns and cirques in this very resistant terrain give it a raw, just exposed appearance that is fresh from the last ice age.

Non Glaciated Plains

The Non-glaciated Plains are the southern, unglaciated component of the Northern Great Plains. They are characterized by low relief and gently rolling grasslands. The bedrock is Cretaceous marine shale and Tertiary fluvial sediments, with some large sandstone units scattered throughout. The other parent material from which soils have developed is loess. Lesser areas dominated by benches topped with lag gravel deposits are fragments of former landscape surfaces. The clinker beds or "scoria" from burnt coal seams form colorful resistant beds in the Tertiary outcrops.

Northern Glaciated Plains

A dominant component of the northern Great Plains, this is a large expanse of prairie with scattered highlands extending above the low relief landscape. This area was overrun by continental glaciers and covered with glacial drift to depths of up to 100 feet. The glacial drift is a mixture of clay to boulder size material. Receding glacial ice also left the distinctive pot and kettle topography of rolling hills with ponds and lakes. Ice damming of the major rivers also deposited areas of lacustrine and delta sediments. Glacial drift is the parent material for many of the Great Plains soils and is markedly different than the Cretaceous marine shales on the rest of the prairie. The Glaciated and Nonglaciated Plains landscapes share commonality in having soils with a distinctive loess component, and the lag gravel remnants of former landscape surfaces on ridge tops and benches.

Rocky Mountain/Beartooth Front

The uplift and thrust faulting that created the Rocky Mountains also resulted in steeply dipping faults along the slopes that face the prairies. The uplift and thrust faulting also pushed the overlying sedimentary rocks into steep dip slopes. In places slopes were too steep to resist the forces of gravity, and large slabs of this rock telescoped by sliding into the low spots in a series of thrust faults. This pile of over thrust and wrinkled rocks are the Mountain Fronts. Near the mountains the sedimentary rocks drape up against the uplifted mountains in steep flatirons on the noses of ridges. Further out, the landscape becomes more gentle and rolling or becomes a series of hogbacks parallel to the mountains. The valleys contain large amounts of outwash gravel often displayed in multiple terraces that give insight into climatic change and hydrologic variation of the last 10,000 years.

Central Montana Island Mountains

The Central Montana Island Mountains occur as widely separated uplifts rising above, and isolated by the surrounding prairie. These mountains are of varied geologic types ranging from volcanic piles with an intrusion in the middle, to uplifted sediments with an intrusion in the middle. At higher elevations the mountains have been glaciated.

Southwest Montana Mountains and Valleys

The dominant features of these landscapes are mountains separated by large, gravel-filled valleys. These large basins dominate the lower elevations. The mountains are complex landforms that include a number of rock types and formative processes, including batholiths and alpine glaciation. The valleys or basins are similar in being broad areas filled with Tertiary sediments and Quaternary gravels. They are commonly linked to other basins along shared rivers and are separated from other basins and landscapes by gorges. The mountains have some general similarities in being sedimentary piles that were uplifted and faulted, with granitic intrusions in core areas. A wide variety of lithologies and ages are thus exposed by erosion. Higher elevations commonly show characteristics of alpine glaciation.

Alpine Glaciated Metasedimentary Mountains

In these environments, the Metasedimentary Mountain landscapes were modified by pervasive alpine glaciation. Large U-shaped valleys with extensive rock outcrop run up to rugged cirques surrounded by craggy shattered peaks. Talus is abundant on slopes, with till, outwash and morainal deposits in the valleys. The deposits of periglacial processes are widespread. Lakes from mechanisms such as pot and kettle, damming by moraines, mass movement, or talus ramparts and cirque lakes are common.

Continental Glaciated Belt Mountains

This landscape setting is made distinctive by the rounding of landforms by continental glaciation. The glacial activity scoured the ridgetops and deposited till on the sideslopes and valley bottoms. These deposits are often 50 to 100 feet thick. Some characteristics remain from the parent Belt Basin landscape but these are heavily modified by glacial action and the addition of till and glacial lake sediments in lower areas. Most of this area retains the mantle of loess and ash on top of the glacial material. The valley deposits are various mixes of till, moraine, outwash and lake deposits- reflecting their recent history of ice damming, diversion, flooding, stagnant or receding ice features such as pot and kettle; and some unique features from catastrophic lake releases, jokulhaups.

Metasedimentary Mountains

In these environments the Belt rocks are lightly metamorphosed quartzite and argillite that are resistant to weathering. In some areas thick carbonate units of dirty limestone, and limestone cemented sediments are also present. The characteristic landforms are large steep slopes in an incised landscape of V-shaped valleys. The loess/ash component is typically missing or greatly reduced on the lower slopes. Talus is common on the lower slopes often extending up to rock outcrop on valley sides. On the northerly aspects the talus often extends upslope and goes under vegetative cover. The larger valleys show evidence of modification by damming from ice and lake sediments, then the resulting erosion and redeposition from catastrophic draining of the

lake. Long stretches of canyons have been stripped to bedrock to about 1000 feet up the valley sides leaving very rocky slopes dominated by talus and outcrop. In these areas soils are largely mixtures of colluvium and loess, and are shallow to bedrock. Likewise, large areas of the valley bottoms are lakebeds. The outwash gravels from these events make up the "bowling ball" aquifers that are unique in their water transmission rates and susceptibility to contamination. The major river of the area follows the Lewis and Clark line-the major structural feature. Tributary valleys correspond generally with secondary structural orientations defined by the edges of the overthrust plates.

Columbia River Basalts

This landscape is the result of the Columbia River Basalts flooding pre-existing terrain to about 3400 feet in elevation. The basalts filled drainage basins and overtopped low ridges, isolating the mountain tops. This produced low relief plateaus and rolling hills dotted with steptoes, the tops of the previous mountains.

The eastern edges of the flooded uplands in Idaho are a mix of lacustrine and stream deposits lying upon, and interbedded with, the basalt flows. Most of these edge flows are invasive basalts that were formed by the denser basalt invading the soft, wet sediments that form the interbeds. The interbeds are not continuous layers, rather they are isolated pockets formed by the damming of ancestral rivers as the basalt flowed up valley. Some were formed by overbank muds, some are lake and pond deposits, and some are channel deposits of sand and gravel. Topographically, the interbeds are expressed by esplanades, (slope breaks or gentle benches), among the cliffs that mark the basalt flows along the canyons. Where the Big Canyon landscapes cut through this landscape the basalts are very unstable and susceptible to all forms of mass wasting.

Idaho Batholith Uplands

The distinctive influence of the granitic parent materials on hydrology, soils, and landforms define this environment. The Idaho Batholith uplands are an expansive, contiguous uplifted area characterized by large rounded mountain masses and basin areas with little rock outcrop. Soils are derived from gruss and loess/ash. This landscape is further modified by the Big Canyon landscape. In areas where cutting by the big canyons occurred, the loess and ash component of soils are typically missing. Another variation may be glaciation, which occurs at higher elevations. Glacially scoured areas have the typical glacial valley U-shapes with exposed rock in the walls. Ridgetops can be either sharp and rocky or gentle wide forms dominated by periglacial processes.

Idaho Canyon Lands

This setting is dominated by the deep entrenchment of the major trunk streams into uplifted highlands. These large canyons penetrate deeply into a number of other landscapes causing rapid changes in a number of ecological variables. Steep, high relief breaks and narrow valley bottoms are characteristic features. The loess/ash components of soils common to adjacent hills are typically missing from these high energy slopes. These canyons sliced through a number of rock types with little regard for lithologic variations-emphasizing the overpowering nature of the process of downcutting in these landscapes. A variety of mass wasting processes are active in this environment. Where the Big Canyons cut through the Basalt Flooded Uplands very large slides and failures are common.

Badlands and Breaks

The Badlands are areas of thinly bedded shales and sandstones. They occur in the plains areas and are areas of accelerated erosion. The factors common to these areas are alternating beds of softer and harder materials with the softer material being impervious material such as clay, near horizontal bedding, and high density intricate drainage patterns. The larger areas have high internal relief but the landform is cut into the surrounding plains or plateau areas. They are a good example of a self-enhancing feedback mechanism.

The breaks are the same type of features that occur along river courses incised into the surrounding plains.

Prairie Potholes

This landscape is a glaciated prairie which is often quite flat but does contain large numbers of shallow pothole lakes and ponds. The surface is glacial till often with a layer of loess on top. The soils are similar to the glaciated plains but there are larger areas of gravelly, bouldery soils. The striking difference is the pot holes and stagnant ice features related to drainage of water from the ice.

Red River Valley

This landscape is composed of the bottom and shorelines of Lake Agassiz as modified by the last 9000 years. The small relief present was created by the old beach terraces and entrenchment of streams into the lake bottom and delta sediments along with some wind movement of loose sediments, primarily silt and sand. Up to 30 meters of glacial rebound are known from elevation differences in beach levels from north to south with the north being higher. Streams are low gradient, and are often meandering. Just below the lake sediments are a complex of till and peat layers. Many areas have high groundwater associated with these layers that maintain numerous ponds. The grasslands are in the Sheyenne Delta where the river emptied into the lake and made more of a water covered fan than a delta. The wind has mobilized the sands into dunes that are partially stabilized by vegetation.

Appendix C

ACREAGE BY LANDFORM GROUP

LANDFORMS	ACRES
Badlands	783,785
Breaks	4,373,721
Breaks, moderately weathered	250,194
Colluvial deposits	23,748
Dissected breaks	317,175
Dissected plains	569,653
Eroded uplands	306,749
Glaciated dissected plains	27,111
Glacio-lacustrine plains	47,411
Glaciated mountain slopes	6,405,843
Glaciated mountain slopes and ridges	210,199
Glaciated plains	32,403
Hills and dunes	75,822
Hills and plateaus	964,967
High relief mountain slopes	408,452
Low relief hills, highly weathered	339,903
Low relief hills, moderately weathered	199,921
Low relief hills	2,185,790
Mountain ridgetops, frost-shattered	2,163,708
Mountain slopes and ridges	9,109,010
Mountain slopes and ridges, moderately weathered	139,119
Mass wasted slopes	524,977
Pediments	30,516
Plains	968,187
Plateaus and buttes	184,761
Glacial troughs and trough walls	161,845
Valleys	4,070,417
Water	443,840
 Total Acres	 40,392,207

Appendix D

ACREAGE BY GEOLOGIC MATERIAL

GEOLOGIC MATERIAL	ACRES
Alluvium	3,075,753
Deltaic sediments	47,411
Gneiss, schist	2,961,719
Granitics	3,339,310
Granitics, highly weathered	1,588,217
Granitics, weakly weathered	1,301,513
Lacustrine sediments	994,663
Loess	964,967
Mixed	579,241
Metasediments	14,175,759
Metasedimentary glacial till	184,540
Quartzite, calc-silicates	241,183
Carbonates	1,456,348
Shale, siltstone, sandstone	2,872,651
Soft sedimentary	90,110
Sandstone, shale	2,238,884
Tertiary sediments	976,556
Volcanics	2,745,322
Wind transported sediments	75,822
Water	443,840
 Total acreage	 40,392,207

Appendix E

ACREAGE OF LANDTYPE ASSOCIATIONS FOR ENTIRE MAPPING AREA

LTA	ACRES
1	968,190
2	32,403
3	569,655
4	27,112
5	783,788
6	306,750
7	184,762
8	47,411
9	75,822
10	924,419
11	994,667
12	1,624,460
13	27,211
14	499,654
17	964,971
20	1,862,824
21	352,055
22	374,677
23	411,720
24	680,456
25	239,915
26	250,195
27	435,331
28	317,176
29	16,756
34	173,106
35	48,360
36	108,526
37	126,821
39	233,061
40	2,844,711
41	1,135,099
42	113,800
43	301,373
44	406,544
45	161,839
46	74,315
47	87,530
50	4,076,840
51	1,268,658
53	410,776
54	180,107
57	284,944
59	139,119
60	3,832,100
61	890,980
62	601,787
63	861,405
64	1,148,177
65	90,110
66	592,827
67	120,574
68	971,083

69	30,516
70	1,014,993
71	344,681
72	325,053
73	80,001
74	102,036
75	55,493
77	241,456
80	139,639
81	699,916
82	369,682
83	953,882
84	339,904
85	199,922
88	22,697
90	524,979
92	23,748
99	443,842
71 LTAs	40,392,207
	ACRES MAPPED

Appendix F

ACREAGE AND PROPORTIONATE EXTENT OF LANDTYPE ASSOCIATIONS BY SECTIONS

SECTION 331A PALOUSE PRAIRIE

LTA	Acres Mapped	% of Mapped	% of Section
10	11,034	0.6	0.3
12	4,482	0.2	0.1
14	20,245	1.1	0.6
17	855,787	45.1	26.4
23	6,961	0.4	0.2
24	210,704	11.1	6.5
59	2,670	0.1	0.1
60	79,294	4.2	2.4
61	3,272	0.2	0.1
62	1,073	0.1	0.0
63	7,634	0.4	0.2
64	263,297	13.9	8.1
80	11,266	0.6	0.3
81	425	0.0	0.0
82	223,530	11.8	6.9
83	167,138	8.8	5.2
84	24,608	1.3	0.8
85	101	0.0	0.0
90	2,621	0.1	0.1
99	1	0.0	0.0
			58.4
19 LTAs	1,896,169 ACRES MAPPED		

**SECTION 331D
NORTHWESTERN GLACIATED PLAINS**

LTA	Acres Mapped	% of Mapped	% of Section
10	982	1.9	0.0
27	148	0.3	0.0
34	6,622	13.2	0.03
36	764	1.5	0.0
43	624	1.2	0.0
44	98	0.2	0.0
53	3,058	6.1	0.0
64	26,813	53.4	0.1
68	8,549	17.0	0.08
90	2,576	5.1	0.0

0.2

10 LTAs 50,241
 ACRES MAPPED

**SECTION 331F
NORTHWESTERN GREAT PLAINS**

LTA	Acres Mapped	% of Mapped	% of Section
1	946,770	34.0	3.6
2	32,403	1.2	0.1
3	516,063	18.8	1.9
4	27,111	1.0	0.1
5	783,355	28.6	2.9
6	116,337	4.2	0.4
7	22,819	0.8	0.1
10	5,917	0.2	0.0
12	50,872	2.0	0.2
14	206,152	7.5	0.8
25	25,390	0.9	0.1
99	5,699	0.2	0.0
			13.6

11 LTAs	2,738,893 ACRES MAPPED

**SECTION 331G
POWDER RIVER BASIN**

LTA	Acres Mapped	% of Mapped	% of Section
1	21,416	4.2	0.1
3	53,589	10.6	0.2
5	429	0.1	0.0
6	190,412	37.7	0.8
7	161,941	32.1	0.7
14	27,147	5.4	0.1
25	50,254	9.9	0.2
			2.25
7 LTAs	505,191 ACRES MAPPED		

**SECTION M331A
YELLOWSTONE HIGHLANDS**

LTA	Acres Mapped	% of Mapped	% of Section
10	44,009	2.5	0.7
12	59,997	3.4	1.0
14	12,271	0.7	0.2
23	25,213	1.4	0.4
25	69,798	4.0	1.1
27	6,506	0.4	0.1
34	93,405	5.3	1.5
36	75,189	4.3	1.2
37	33,733	1.9	0.5
39	150,081	8.5	2.4
40	626	0.0	0.0
41	117,326	6.7	1.9
42	60,666	3.4	1.0
43	42,458	2.4	0.7
44	17,976	1.0	0.3
51	760	0.0	0.0
53	76,853	4.4	1.2
54	87,011	4.9	1.4
57	177,582	10.1	2.9
62	15,110	0.9	0.2
63	179,717	10.2	2.9
64	21,460	1.2	0.3
68	152,581	8.7	2.5
69	412	0.0	0.0
72	25,079	1.4	0.4
73	16,886	1.0	0.3
74	10,729	0.6	0.2
77	62,911	3.6	1.0
90	113,376	6.4	1.8
99	13,557	0.8	0.2

28.4

30 LTAS 1,763,291
ACRES MAPPED

**SECTION M331B
BIG HORN MOUNTAINS**

LTA	Acres Mapped	% of Mapped	% of Section
27	21,388	28.8	3.2
66	52,103	70.1	7.9
92	879	1.2	0.1
			11.2
3 LTAS	74,370 ACRES MAPPED		

**SECTION M332A
IDAHO BATHOLITH**

LTA	Acres Mapped	% of Mapped	% of Section
10	9,581	0.3	0.2
12	10,308	0.3	0.3
14	8,100	0.3	0.2
17	30	0.0	0.0
20	8,070	0.3	0.2
21	209,877	6.6	5.4
22	283,624	9.0	7.3
23	129,732	4.1	3.3
24	11,592	0.4	0.3
26	215,922	6.8	5.6
29	10,532	0.3	0.3
39	42,652	1.3	1.1
40	4,756	0.2	0.1
41	401,415	12.7	10.3
45	71,071	2.2	1.8
46	35,567	1.1	0.9
47	6,809	0.2	0.2
51	281,987	8.9	7.3
57	54,631	1.7	1.4
59	129,742	4.1	3.3
60	63,800	2.0	1.6
61	95,759	3.0	2.5
62	129,836	4.1	3.3
63	96,467	3.1	2.5
64	18,316	0.6	0.5
70	1,385	0.0	0.0
71	62,411	2.0	1.6
72	177,263	5.6	4.6
73	4,171	0.1	0.1
77	159,797	5.1	4.1
80	1,243	0.0	0.0
81	139,140	4.4	3.6
82	26,996	0.9	0.7
83	27,852	0.9	0.7
84	20,976	0.7	0.5
85	180,023	5.7	4.6
90	29,413	0.9	0.8
			81.3

37 LTAS 3,160,073
ACRES MAPPED

**SECTION M332B
BITTERROOT VALLEY**

LTA	Acres Mapped	% of Mapped	% of Section
10	201,963	4.1	4.1
11	117,468	2.4	2.4
12	292,138	5.9	5.9
14	33,479	0.7	0.7
20	360,304	7.2	7.2
21	18,000	0.4	0.4
22	59,119	1.2	1.2
23	100	0.0	0.0
24	14,377	0.3	0.3
25	13,741	0.3	0.3
27	9,864	0.2	0.2
29	5,637	0.1	0.1
34	46,982	0.9	0.9
35	27,907	0.6	0.6
37	6,635	0.1	0.1
40	401,649	8.1	8.1
41	338,618	6.8	6.8
43	77,618	1.6	1.6
44	18,787	0.4	0.4
45	83,690	1.7	1.7
47	3,765	0.1	0.1
50	312,518	6.3	6.3
51	197,817	4.0	4.0
53	6,924	0.1	0.1
54	18	0.0	0.0
57	9,352	0.2	0.2
60	767,352	15.4	15.4
61	92,627	1.9	1.9
62	152,086	3.1	3.1
63	5,513	0.1	0.1
64	123,770	2.5	2.5
65	30,430	0.6	0.6
66	78,732	1.6	1.6
67	72,462	1.5	1.5
68	84,764	1.7	1.7
70	137,464	2.8	2.8
71	17,693	0.4	0.4
72	94,500	1.9	1.9
73	15,223	0.3	0.3
74	6,424	0.1	0.1
75	15,252	0.3	0.3
80	4,765	0.1	0.1
81	105,939	2.1	2.1
82	10,401	0.2	0.2
83	295,900	5.9	5.9
90	28,774	0.6	0.6
92	6,383	0.1	0.1
99	5,737	0.1	0.1
			100%
48 LTAS	4,983,813 ACRES MAPPED		

**SECTION M332C
ROCKY MOUNTAIN FRONT**

LTA	Acres Mapped	% of Mapped	% of Section
10	17,094	1.5	1.2
11	54	0.0	0.0
12	40,434	3.5	2.8
20	13,657	1.2	1.0
25	4,114	0.4	0.3
27	97,585	8.4	6.8
29	585	0.1	0.0
34	233	0.0	0.0
36	13,447	1.2	0.9
37	4,663	0.4	0.3
40	242,389	20.9	16.9
43	158,089	13.6	11.0
44	101,583	8.7	7.1
47	68	0.0	0.0
50	36,540	3.1	2.5
53	164,005	14.1	11.4
60	57,511	4.9	4.0
66	37,295	3.2	2.6
68	80,557	6.9	5.6
70	10,568	0.9	0.7
74	3,827	0.3	0.3
83	329	0.0	0.0
90	67,272	5.8	4.7
99	10,600	0.9	0.7
			81.6
22 LTAS	1,161,873 ACRES MAPPED		

**SECTION M332D
BELT MOUNTAINS**

LTA	Acres Mapped	% of Mapped	% of Section
10	86,889	2.9	0.9
12	68,706	2.3	0.7
14	2,606	0.1	0.0
20	13,713	0.5	0.1
21	8,423	0.3	0.1
24	4,485	0.2	0.0
25	20,570	0.7	0.2
27	235,563	8.0	2.5
34	15,602	0.5	0.2
36	12,477	0.4	0.1
37	46,990	1.6	0.5
39	5,300	0.2	0.1
40	7,828	0.3	0.1
41	100,346	3.4	1.1
42	23,865	0.8	0.3
43	12,878	0.4	0.1
44	15,947	0.5	0.2
50	5,840	0.2	0.1
51	98,809	3.3	1.1
53	10,191	0.3	0.1
54	45,449	1.5	0.5
57	569	0.0	0.0
60	310,782	10.5	3.4
61	251,536	8.5	2.7
62	88,948	3.0	1.0
63	149,345	5.0	1.6
64	197,349	6.7	2.1
65	42,266	1.4	0.5
66	379,757	12.8	4.1
67	41,037	1.4	0.4
68	336,244	11.4	3.6
70	419	0.0	0.0
72	3,365	0.1	0.0
73	23,449	0.8	0.3
74	859	0.0	0.0
75	36,716	1.2	0.4
77	78	0.0	0.0
81	106,587	3.6	1.2
82	13,249	0.4	0.1
83	95,156	3.2	1.0
90	73,847	2.5	0.8
92	12,928	0.4	0.1
99	451	0.0	0.0

44 LTAS 2,958,890 ACRES MAPPED

**SECTION M332E
BEAVERHEAD MOUNTAINS**

LTA	Acres Mapped	% of Mapped	% of Section
10	91,973	3.0	1.5
12	61,015	0.4	0.2
13	13,552	0.4	0.2
14	94,932	3.1	1.5
20	72,325	2.4	1.1
21	41,402	1.4	0.7
23	23,278	0.8	0.4
25	45,709	1.5	0.7
27	62,706	2.1	1.0
34	10,242	0.3	0.2
35	20,411	0.7	0.3
36	6,646	0.2	0.1
37	34,777	1.1	0.6
39	35,017	1.2	0.6
40	100,569	3.3	1.6
41	129,472	4.3	2.1
42	8,103	0.3	0.1
43	9,447	0.3	0.2
44	33,804	1.1	0.5
45	2,117	0.1	0.0
50	105,881	3.5	1.7
51	125,884	4.1	2.0
53	40,971	1.3	0.7
54	31,160	1.0	0.5
57	33,678	1.1	0.5
60	90,807	3.0	1.4
61	308,903	10.2	4.9
62	949	0.0	0.0
63	110,855	3.7	1.8
64	216,232	7.1	3.4
65	17,413	0.6	0.3
66	41,078	1.4	0.7
68	262,471	8.6	4.2
69	2,408	0.1	0.0
70	132,440	4.4	2.1
71	83,017	2.7	1.3
72	838	0.0	0.0
73	14,106	0.5	0.2
74	70,884	2.3	1.1
75	3,523	0.1	0.1
77	18,667	0.6	0.3
81	36,161	1.2	0.6
82	6,817	0.2	0.1
83	151,949	5.0	2.4
88	22,687	0.7	0.4
90	107,357	3.5	1.7
92	3,557	0.1	0.1
99	1,272	0.0	0.0
			48.2
48 LTAS	3,036,244 ACRES MAPPED		

**SECTION M332G
BLUE MOUNTAINS**

LTA	Acres Mapped	% of Mapped	% of Section
10	433	0.1	0.0
12	5,193	0.7	0.4
17	9,801	1.3	0.7
22	18,597	2.5	1.4
24	420,518	56.8	31.2
26	29,535	4.0	2.2
42	21,164	2.9	1.6
51	1,459	0.2	0.1
54	16,458	2.2	1.2
59	6,706	0.9	0.5
62	2,305	0.3	0.2
64	133,556	18.0	9.9
72	433	0.1	0.0
73	6,159	0.8	0.5
82	44,956	6.1	3.3
90	23,333	3.1	1.7
16 LTAS	740,615 ACRES MAPPED		55.0

**SECTION M333A
OKANOGAN HIGHLANDS**

LTA	Acres Mapped	% of Mapped	% of Section
10	38,951	2.2	1.3
11	220,526	12.5	7.1
12	323,513	18.4	10.4
14	14,384	0.8	0.5
20	17,556	1.0	0.6
22	4,297	0.2	0.1
28	429	0.0	0.0
40	6,270	0.4	0.2
41	22,952	1.3	0.7
46	30,843	1.8	1.0
50	180,003	10.2	5.8
51	467,331	26.5	15.1
60	124,084	7.0	4.0
61	16,288	0.9	0.5
62	162,063	9.2	5.2
63	28	0.0	0.0
64	6,316	0.4	0.2
66	513	0.0	0.0
72	4,337	0.2	0.1
99	120,874	6.9	3.9
			58.6
19 LTAS	1,761,581 ACRES MAPPED		

**SECTION M333B
FLATHEAD VALLEY**

LTA	Acres Mapped	% of Mapped	% of Section
10	191,532	3.5	3.5
11	533,326	9.8	9.8
12	428,208	7.8	7.8
14	33,343	0.6	0.6
20	212,411	3.9	3.9
40	221,169	4.0	4.0
47	27,452	0.5	0.5
50	2,681,456	49.1	49.1
51	90,791	1.7	1.7
53	8,091	0.1	0.1
58	164,491	3.0	3.0
60	497,972	9.1	9.1
64	19,044	0.3	0.3
68	8,043	0.1	0.1
70	153,508	2.8	2.8
72	967	0.0	0.0
90	1,358	0.0	0.0
99	192,821	3.5	3.5
			100
17 LTAS	5,463,336 ACRES MAPPED		

**SECTION M333C
NORTHERN ROCKIES**

LTA	Acres Mapped	% of Mapped	% of Section
10	63,720	1.9	1.9
11	11,821	0.4	0.4
12	97,651	2.9	2.9
14	5,120	0.2	0.2
20	163,793	4.9	4.9
25	10,321	0.3	0.3
27	461	0.0	0.0
40	1,637,034	48.9	48.9
43	235	0.0	0.0
44	218,230	6.5	6.5
50	687,672	20.6	20.6
53	100,613	3.0	3.0
58	20,031	0.6	0.6
60	114,155	3.4	3.4
66	164	0.0	0.0
68	36,067	1.1	1.1
70	60,686	1.8	1.8
74	9,208	0.3	0.3
90	58,472	1.7	1.7
99	49,133	1.5	1.5

100 .%

19 LTAS 3,344,596
ACRES MAPPED

**SECTION M333D
BITTERROOT MOUNTAINS**

LTA	Acres Mapped	% of Mapped	% of Section
10	160,282	2.4	2.3
11	111,455	1.6	1.6
12	181,889	2.7	2.6
14	41,867	0.6	0.6
17	99,346	1.5	1.4
20	1,000,850	14.7	14.5
21	73,456	1.1	1.1
22	9,036	0.1	0.1
23	226,415	3.3	3.3
24	14,019	0.2	0.2
26	4,712	0.1	0.1
28	316,745	4.7	4.6
40	222,209	3.3	3.2
41	24,915	0.4	0.4
45	3,610	0.1	0.1
46	7,904	0.1	0.1
47	49,434	0.7	0.7
50	66,747	1.0	1.0
51	3,788	0.1	0.1
53	42	0.0	0.0
57	9,130	0.1	0.1
60	1,726,317	25.4	25.1
61	122,584	1.8	1.8
62	49,409	0.7	0.7
63	311,815	4.6	4.5
64	123,010	1.8	1.8
66	594	0.0	0.0
67	7,073	0.1	0.1
68	1,511	0.0	0.0
70	518,308	7.6	7.5
71	181,557	2.7	2.6
72	17,671	0.3	0.3
80	122,360	1.8	1.8
81	270,383	4.0	3.9
82	43,729	0.6	0.6
83	292,046	4.3	4.2
84	294,317	4.3	4.3
85	19,796	0.3	0.3
90	16,505	0.2	0.2
99	43,676	0.6	0.6
			98.8

40 LTAS 6,790,567
ACRES MAPPED

**SECTION 342A
BIGHORN BASIN**

LTA	Acres Mapped	% of Mapped	% of Section
27	1,069	29.8	0.0
66	2,524	70.2	0.1
			0.14
2 units	3594 ACRES MAPPED		

**SECTION 251A
RED RIVER VALLEY**

LTA	Acres Mapped	% of Mapped	% of Section
8	44,171	33.7	0.1
9	73,167	55.9	0.5
13	13,659	10.4	0.8
			1.4
3 LTAS	130,998 ACRES MAPPED		

SECTION 251B
NORTH CENTRAL GLACIATED PLAINS

LTA	Acres Mapped	% of Mapped	% of Section
8	3,239	55.0	0.1
9	2,655	45.0	0.1
			0.2
2 units	5,894 ACRES MAPPED		

Appendix G

LANDTYPE ASSOCIATION LEGEND ARRANGED BY GEOLOGIC MATERIAL AND LANDFORM

Earlier in this document the legend that was used for the mapping is given. It was organized with landform as the first separation and geologic material as the second. For the convenience of the reader a second version is provided here that has geologic material as the first break and landform as the second. This format is similar to the legend displayed on the 1:100,000 scale maps.

Alluvium

- 10 Valleys, Coarse Deposits
- 14 Valleys, Fine Deposits

Glacial Sediments

- 8 Glaciolacustrine Plains: Deltaic Sediments
- 11 Valleys: Lacustrine Sediments
- 12 Valleys: Coarse Sediments
- 13 Valleys: Fine Sediments

Sandy Wind Deposited Sediments

- 9 Hills and Dunes

Loess

- 17 Hills and Plateaus

Metasedimentary (Belt)

- 20 Breaks
- 28 Dissected Breaks
- 40 Steep Glaciated Mountain Slopes
- 47 Alpine Troughs and Trough Walls
- 50 Glaciated Mountain Slopes
- 60 Mountain Slopes and Ridges
- 70 Frost Shattered Mountain Ridge Tops
- 80 Low Relief Hills

Carbonates

- 27 Breaks
- 37 High Relief Mountain Slopes
- 43 Steep Glaciated Mountain Slopes
- 66 Mountain Slopes and Ridges

Granitics

- 21 Breaks, Highly Weathered
- 22 Breaks, Weakly Weathered
- 41 Steep Glaciated Mountain Slopes
- 45 Weakly Glaciated Mountain Slopes and Ridges
- 46 Alpine Troughs and Trough Walls
- 51 Glaciated Mountain Slopes
- 61 Mountain Slopes and Ridges, Highly Weathered
- 62 Mountain Slopes and Ridges, Weakly Weathered
- 71 Frost Shattered Mountain Ridge Tops, Highly Weathered
- 72 Frost Shattered Mountain Ridge Tops, Weakly Weathered
- 81 Low Relief Hills

Volcanics

- 24 Breaks
- 34 High Relief Mountain Slopes
- 42 Steep Glaciated Mountain Slopes
- 54 Glaciated Mountain Slopes
- 64 Mountain Slopes and Ridges
- 73 Frost Shattered Mountain Ridge Tops
- 82 Low Relief Hills

Sandstones and Shales

- 25 Breaks
- 36 High Relief Mountain Slopes
- 44 Steep Glaciated Mountain Slopes
- 53 Glaciated Mountain Slopes
- 68 Mountain Slopes and Ridges
- 74 Frost Shattered Mountain Ridge Tops

Soft Sedimentary Rocks

- 65 Mountain Slopes and Ridges

Shales, Siltstones and Sandstones

- 1 Plains
- 2 Glaciated Plains
- 3 Dissected Plains
- 4 Glaciated Dissected Plains
- 5 Badlands
- 6 Eroded Uplands
- 7 Erosional Plateaus and Buttes

Quartzites and Calc-silicates

- 29 Breaks
- 35 Weakly Glaciated Mountain Slopes and Ridges
- 67 Mountain Slopes and Ridges
- 75 Frost Shattered Mountain Ridge Tops

Gneisses and Schists

- 23 Breaks
- 26 Breaks, Moderately Weathered
- 39 Steep Glaciated Mountain Slopes
- 57 Glaciated Mountain Slopes
- 59 Mountain Slopes and Ridges, Moderately Weathered
- 63 Mountain Slopes and Ridges
- 77 Frost Shattered Mountain Ridge Tops
- 84 Low Relief Hills, Highly Weathered
- 85 Low Relief Hills, Moderately Weathered

Tertiary Sediments

- 83 Low Relief Hills, Coarse Sediments
- 88 Low Relief Hills, Fine Sediments

Undifferentiated (Mixed Geology)

- 69 Pediment
- 90 Mass Wasted Slopes
- 92 Colluvial Slopes

Miscellaneous

- 99 Lakes and Reservoirs

Appendix H

LIST OF COMMON AND SCIENTIFIC NAMES FOR POTENTIAL NATURAL VEGETATION SERIES USED IN THIS REPORT

Alkali grass	<i>Puccinellia nuttalliana</i>
Aspen	<i>Populus tremuloides</i>
Baltic rush	<i>Juncus balticus</i>
Basswood	<i>Tilia americana</i>
Big bluestem	<i>Andropogon gerardii</i>
Bluebunch wheatgrass	<i>Agropyron spicatum</i>
Big sagebrush	<i>Artemisia tridentata wyomingensis</i>
Buffaloberry	<i>Shepherdia argentea</i>
Burr oak	<i>Quercus macrocarpa</i>
Curlleaf mountain mahogany	<i>Cercocarpus ledifolius</i>
Douglas-fir	<i>Pseudotsuga mensiesii</i>
Engelmann spruce	<i>Picea engelmannii</i>
Geyer willow	<i>Salix geyeriana</i>
Grand fir	<i>Abies grandis</i>
Greasewood	<i>Sarcobatus vermiculatus</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Hairy grama	<i>Bouteloua hirsuta</i>
Holm's Rocky Mountain Sedge	<i>Carex scopulorum</i>
Horizontal juniper	<i>Juniporus horizontallis</i>
Idaho fescue	<i>Festuca idahoensis</i>
inland saltgrass	<i>Distichlis spicata.</i>
Little bluestem	<i>Andropogon scoparius</i>
Limber pine	<i>Pinus flexilis</i>
Low sagebrush	<i>Artemisia arbuscula</i>
Mountain big sage	<i>Artemisia tridentata vaseyana</i>
Mountain hemlock	<i>Tsuga mertensiana</i>
Needle and thread	<i>Stipa comata</i>
Parry's rush	<i>Juncus parryi</i>
Plains cottonwood	<i>Populus deltoides</i>
Ponderosa pine	<i>Pinus ponderosa</i>
Prairie cordgrass	<i>Spartina pectinata</i>
Prairie sandreed	<i>Calamovilfa longifolia</i>
Rocky Mountain juniper	<i>Juniporus scopulorum</i>
Rough fescue	<i>Festuca scabrella</i>
Sand bluestem	<i>Andropogon hallii</i>
Shadscale	<i>Atriplex confertifolia</i>
Shrubby cinquefoil	<i>Potentilla fruiticosa</i>
Silver sagebrush	<i>Artemisia cana</i>
Skunkbrush	<i>Rhus aromatica</i>
Slender wheatgrass	<i>Agropyron caninum</i>
Subalpine fir	<i>Abies lasiocarpa</i>
Tufted hairgrass	<i>Deschampsia caespitosa</i>
Water sedge	<i>Carex aquatilis</i>
Western hemlock	<i>Tsuga heterophylla</i>
Western redcedar	<i>Thuja plicata</i>
Western snowberry	<i>Symphoricarpus occidentalis</i>
Western wheatgrass	<i>Agropyron smithii</i>
White dryad	<i>Dryas octopetala</i>
Whitebark pine	<i>Pinus albicaulis</i>

Appendix I

GLOSSARY

The definitions listed below are taken from the following sources : 1) the Glossary of Landforms in the USDA Natural Resource Conservation Service National Soils Handbook, 2) the American Geological Institute's Dictionary of Geological Terms, and 3) the American Fisheries Society's Glossary of Stream Habitat Terms. Consult the reference section for complete citations.

Alluvial: Pertaining to material or processes associated with transportation and/or subaerial deposition by concentrated running water.

Alluvium: Unconsolidated clastic material deposited by running water, including gravel, sand, silt, clay and various mixtures of these.

Antecedent stream: A stream that flowed in its present course prior to the development of the existing topography; a stream that was established before local uplift began and incised its channel at the same rate the land was rising.

Archean: The term, meaning ancient, has been generally applied to the oldest rocks of the Precambrian.

Badlands: A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluvies. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

Batholith: A body of intrusive rock at least 40 square miles in area.

Cenozoic: The latest of the four eras into which geologic time, as recorded by the stratified rocks of the earth's crust, is divided; it extends from the close of the Mesozoic Era to and including the present.

Cirque: Semicircular, concave, bowl-like area with steep face primarily resulting from erosive activity of a mountain glaciers.

Colluvial: Pertaining to material or processes associated with transportation and/or deposition by mass movement (direct gravitational action) and local, unconcentrated runoff on sideslopes and/or at the base of slopes.

Colluvium: Unconsolidated, unsorted earth material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff.

Crystalline: Of, or pertaining to the nature of a crystal, having regular molecular structure. Contrasted with amorphous (without form)

Ephemeral stream: A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no protracted supply from melting snow or other source, and its channel is, at all times, above the water table.

Felsic: a light colored rock containing feldspar and silica.

Fluvial: Of or pertaining to rivers; produced by river action.

Frost shattering: The mechanical disintegration or breakup of a rock or soil caused by the pressure exerted by freezing water in cracks or pores, or along bedding planes.

Geomorphic: Of, or pertaining to, the figure of the earth or the form of its surface.

Glaciofluvial deposits: Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits: Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many are bedded or laminated with varves or rhythmites.

Hogback: A sharp anticlinal, ridge, decreasing in height at both ends until it runs out; a ridge produced by highly tilted strata.

Horn: A high pyramidal peak with steep sides formed by the intersecting walls of three or more cirques, as, the Matterhorn.

Jokulhlaup: An Icelandic term for a glacial outburst flood, especially when an ice dam impounding a glacial lake breaks. Such breaks drained glacial Lake Missoula and created the Channeled Scablands in the Pacific Northwest.

Lag gravel: Residual accumulations of coarse particles from which the finer material has been blown away.

Landform: One of the multitudinous features that taken together make up the surface of the earth. It includes all broad features, such as plain, plateau, and mountain, and also all the minor features, such as hill, valley, slope, canyon, and alluvial fan.

Loess: Fine-grained, wind-deposited material, dominantly of silt size.

Mafic minerals: In general, synonymous with "dark minerals: as usually used; basic; pertaining to or composed dominantly of the magnesian rock forming silicates.

Mazama volcanic ash: Ash that originated at the present site of Crater Lake in Oregon. Crater Lake is the remnant of a volcanic peak named Mount Mazama which once occupied the site and was the source of much of the volcanic ash deposited in the Pacific Northwest.

Metasedimentary rocks: Sedimentary rocks which show evidence of having been subjected to metamorphism.

Outwash: Stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by melt-water streams and deposited in front of or beyond the end moraine or the margin of an active glacier. The coarser material is deposited nearer to the ice.

Pediment: A gently sloping erosional surface developed at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland.

Periglacial: Refers to areas, conditions, processes, and deposits adjacent to the margin of a glacier.

Potential vegetation: The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions.

Proterozoic: In common use the younger of the two Precambrian eras.

Residuum: Unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place.

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream or other body.

Scree slope: Any slope covered with loose rock fragments. Same as talus.

Series: A group of habitat types having the same potential climax tree (shrub or grass) species.

Talus: A collection of fallen disintegrated material which has formed a slope at the foot of a steeper declivity. Same as scree.

Till: Dominantly unsorted and unstratified drift, deposited by a glacier, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders.

Tor: A high, isolated pinnacle, or rocky peak, or a pile of rocks, much jointed and usually granitic, exposed to intense weathering, and often assuming peculiar or fantastic shapes.

Weathering: All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth's surface by atmospheric or biologic agents or circulating surface waters with essentially no transport of the altered material. These changes result in disintegration and decomposition of the material.

Appendix J

REFERENCES

- American Fisheries Society. 1985. Glossary of stream habitat terms. Bethesda, MD: American Fisheries Society, Habitat Index Committee, West Division. 34 p.
- American Geological Institute. 1976. Dictionary of geological terms, revised edition. Anchor Press/Doubleday, Garden City, New York
- Bailey, R. G.; Avers, P. E.; King, T.; McNab, W. H. eds. 1994a. Ecoregions and subregions of the United States (map). Washington, D.C.: 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. and Bourgeron, P.S. 1994b. Design and use of ecological units. In: Jensen, M.E.; Bourgeron, P.S. tech. eds. 1994. Volume II: Ecosystem management: principles and applications. Gen. Tech. Rep. PNW-GTR-318. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 376p.
- Baker, C. H., Jr. 1967. Geology and ground water resources of Richland County, ND. North Dakota Geological Survey. Fargo, ND. Bulletin 46, 45 p
- Beaverhead National Forest. 1991. Classification of alpine habitat types for mountain ranges of the Beaverhead National Forest. Unpublished report. USDA Forest Service, Dillon, Montana
- Becraft, G. E., and Pinckney, D. M. 1961 Preliminary Geologic Map of the Northwest Quarter of the Boulder Quadrangle, Montana. Mineral Investigations Field Studies Map, MF-183. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:24,000, 1 sheet.
- Becraft, G. E.; Pinckney, D.; Rosenblum, S. 1963. Geology and Mineral Deposits of the Jefferson City Quadrangle, Jefferson and Lewis and Clark Counties, Montana. U.S.G.S. Professional Paper 428. Washington, D.C.: U.S. Government Printing office.
- Billingsley, Owen. 1975. Planning Geology for the Upper Willow Creek Drainage, Philipsburg Ranger District, Deerlodge National Forest. Unpublished Report. Butte, Montana: Deerlodge National Forest. Scale 1:31,680, 9 sheets.
- Bluemle, J. P. 1979 Geology of Ransom and Sargent Counties, ND, North Dakota Geological Survey. Fargo, ND. Bulletin 69, 84p.
- Calkings, F. C.; and Emmons, W. H. 1915. Geologic Atlas of the United States, Philipsburg folio, Montana. Washington, D.C.: U.S. Department of Interior, Geological Survey.
- Caprio, J. M.; Cooksey, D. I.; Jackson, J. S.; Nielsen, G. A.; and Roche, R. R. 1994. MAPS Atlas: a land and climate information system, version 5.0. Extension Service. Montana State University, Bozeman, Montana
- Carlson, C. G. 1983, Geology of Billings, Golden Valley, and Slope Counties, North Dakota. North Dakota Geological Survey. Fargo, ND. Bulletin 76, 40 p
- Carlson, C. G. 1985. Geology of McKenzie County, ND. North Dakota Geological Survey. Fargo, ND. Bulletin 80. 54 p
- Carlson, C. G. 1982. Geology of Grant and Sioux Counties, ND. North Dakota Geological Survey. Fargo, ND. Bulletin 67. 32 p.

- Carrara, P. E. 1990. Surficial geologic map of Glacier National Park, Montana. Map I-1508-D. Department of the Interior. Geological Survey
- Clark, Dean S. 1953. Reconnaissance Geology of a Portion of Powell and Deer Lodge Counties, Montana. Unpublished Master Thesis, Indiana University.
- Clayton, J. L. and Arnold, J. F. 1972. Practical grain size fracturing density, and weathering classification of intrusive rocks of the Idaho Batholith, Intermountain Forest and Range Experiment Station, General Technical Report INT-2, Ogden, Utah)
- Cole, N. J.; Joy, J. W.; and Koch, H. 1979. Unpublished Habitat Type Maps of the Deerlodge National Forest. Scale 1:24,000, 96 sheets.
- Cooper, S. V; Neiman, K. E. and Roberts, D. W. 1991. Forest habitat types of northern Idaho: a second approximation. Gen. Tech Rpt. INT-236. USDA Forest Service, Intermountain Research Station, Ogden, Utah
- Davis, C. and Shovic H. F. 1996. Soil survey of the Gallatin National Forest Montana, USDA Forest Service, Bozeman, Montana
- Derkey, P. D. and Bartholomew, M. J. 1988. Geologic Map of the Ramsay Quadrangle, Montana. Geologic Map 47. Butte, Montana: Bureau of Mines and Geology. Scale 1:24,000, 1 sheet.
- Earll, F. N. 1972. Mines and Mineral deposits of the Southern Flint Creek Range, Montana. Bulletin 84. Butte, Montana: Bureau of Mines and Geology.
- ECOMAP. 1993. National hierarchical framework of ecological units. Unpublished administrative paper. Washington, D.C. U.S Department of Agriculture, Forest Service. 20p.
- Fairbridge, R. W., Ed. 1968. The Encyclopedia of Geomorphology. New York: Reinhold.
- Girard, M. H.; Geotz, H. and Bjugstad, A. J. 1989. Native woodland habitat types of southwestern North Dakota. Research Paper 281, USDA -FS, Rocky Mtn. Forest and Range Exp Station. Ft Collins, Colorado. pp. 36.
- Green, P. and Kellogg, G. 1987. Soil Survey of Nez Perce National Forest Area. USDA Forest Service, Grangeville, Idaho. 527 pp.
- Gwin, V. E. 1960 Geology of the Drummond Area, Central Western Montana. special Publication 21. Butte, Montana: Montana Bureau of Mines and Geology. Scale 1:62,000, 1 sheet.
- Hansen P. L. and Hoffman, G. R. 1988. The vegetation of the Grand River/Cedar River, Sioux and Ashland Districts of the Custer National Forest: a Habitat Type classification. USDA-FS Rocky Mtn Forest and Range Exp Sta. Ft. Collins, Colorado. pp. 68.
- Hansen P. L.; Hoffman, G. R. and Bjugstad, A. J. 1984. The vegetation of Theodore Roosevelt National Park, North Dakota: a habitat type classification. USDA-FS Rocky Mtn Forest and Range Exp Sta. Ft. Collins, Colorado. pp. 33.
- Hanson, P. L; Pfister, R. D.; Boggs, K.; Cook, B. J.; Joy, J. and Hinckley, D. K. 1995. Classification and Management of Montana's Riparian and Wetland sites. Montana Forest and Conservation Exp Station. School of Forestry, University of Montana. Misc Publication No. 54. Missoula Montana. pp. 646.
- Harrison, J. E.; Cressman, E. R.; Whipple, W. 1992. Geologic and structure maps of Kalispell Quadrangle, Montana, and Alberta and British Columbia, Map I-2267. Department of the Interior, U.S. Geological Survey.

Harrison, J. E.; Griggs, A. B.; and Wells, J. D. 1986. Geologic and structure maps of Wallace Quadrangle, Montana and Idaho. Map I-1509-A. Department of the Interior, U.S. Geological Survey

Hirsch, K. J. and Barker, W. T. 1984. Classification of grasslands and shrublands in southwestern North Dakota. Doctoral dissertation. North Dakota State University. Fargo North Dakota.

Holdorf, H. 1981. Soil Resource Inventory of the Lewis and Clark National Forest. USDA Forest Service. Great Falls, Montana.

Holdorf, H. and Donahue, J. 1990. Landforms for soil surveys in the northern Rockies. Misc. Pub. No 51, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula

Holdorf, H. and Sirucek, D. 1989. Soil Survey of the Helena National Forest. In-Service Report. USDA Forest Service. Helena, Montana

Klepper, M. R.; Weeks, R. A. and Ruppel, E. T. 1957. Geology of the Southern Elkhorn Mountains, Jefferson and Broadwater Counties, Montana. U.S.G.S. Professional Paper 292. Washington, D.C.: U.S. Department of Interior, Geological Survey.

Kuennen, L. J. and Nielsen-Gerhardt, M. L. 1995. Soil Survey of Kootenai National Forest Area, Montana and Idaho.

Lewis, S. E. 1990. Geologic Map of the Dickie Peak Quadrangle, Montana. Geologic Map 51. Butte, Montana: Bureau of Mines and Geology. Scale 1:24,000.

Lustgraaf, W. J. 1974. Atlas of Geology, Upper rock Creek Area, Deerlodge National Forest. Unpublished Maps. Scale 1:31,680, 16 sheets.

Martinson, A. H. and Basko, W. J. 1983. Flathead Country - Land System Inventory. U.S. Department of Agriculture, Forest Service. Kalispell, Montana

Maxwell, J. C. 1965. Structure Map and Cross Sections, Southwest Drummond Area. In Fields, R.W. and Warren Shepard, eds.. Geology of the Flint Creek Range, Montana, Billings Geological Society Sixteenth Annual Field Conference Guidebook. Billings, Montana: Billings Geological Society. Scale 1:40,000, 1 sheet.

McGill, G. E. 1959. Geologic Map, Northwest Flank, Flint Creek Range, Montana. Special Publication 18. Butte, Montana: Bureau of Mines and Geology. Scale 1:40,000, 1 sheet.

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

Montana Riparian Association. 1995. Classification and management of Montana's riparian and wetland sites. Misc. Pub. No. 54. Montana Forest and Conservation Experiment Station. School of Forestry, University of Montana, Missoula

Moore, G. T. 1956. The Geology of the Mount Fleecer Area, Montana. Unpublished Dissertation, Indiana University.

Mudge, M. R. and Earhart, R. L. 1991. Geologic map of the Bob Marshall and Great Bear Wilderness and adjacent study areas, northwest Montana. Map I-2181. Department of the Interior. U.S. Geological Survey

Mudge, M. and Earhart, R. 1983. Bedrock geologic map of part of the northern disturbed Belt, Montana. U.S. Geological Survey, Miscellaneous Investigative Series Map I-1375.

Mueggler, W. F. and Stewart, W. L. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service. Gen. Tech. Rpt. INT-66, Intermountain Forest and Range Exp. Stn., Ogden, Utah

Mutch, T. A. 1960. Geologic Map of the Northeast Flank of the Flint Creek Range, Western Montana. Special Publication 22. Butte, Montana: Bureau of Mines and Geology. Scale 1:63,360, 1 sheet.

Nelson, W. T.; Barker, William T.; and Goetz, Harold. 1984. Habitat type Classification of Grasslands of Sheyenne National Grassland of southwestern North Dakota. Completion Report for cooperative agreement No. RM-80-139-CA. pp. 78

Nesser, J.A.; Ford, G.L., Maynard, C.L. and Page-Dumroese, D.S. 1997. Ecological units of the Northern Region: subsections, first approximation. Intermountain Research Station. General Technical report XX.

Pfister, R. D.; Kovalchick, B. L.; Arno, S. F.; and Presby, R. C. 1977. Forest habitat types of Montana. Intermountain Forest and Range Exp. Stn. Gen. Tech Rpt. INT-34, Ogden, Utah

Pinckney, D. M. and Becraft, G. E. 1961. Preliminary Geologic Map of the Southwest Quarter of the Boulder Quadrangle, Montana. Mineral Investigations Field Studies Map, MF-187. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:24,000, 1 sheet.

Poff, R. J. and Svoboda, D. J. 1980. Land systems inventory for the Beaverhead National Forest, Unpublished office file report. USDA Forest Service, Dillon, Montana

Poulter, G. J. 1956. Geology of the Georgetown Thrust Area Southwest of Philipsburg, Montana. Geological Investigations Map No. 1. Butte, Montana: Bureau of Mines and Geology. Scale 1:48,000, 1 sheet.

Reid, R. R. 1957. Bedrock Geology of the North End of the Tobacco Root Mountains, Madison County, Montana. Memoir 36. Butte, Montana: Bureau of Mines and Geology.

Richlen, E. M.; et al. 1976. Land System Inventory Guide. Document R1-76-20. Missoula, Montana: U.S. Department of Agriculture, Forest Service, Northern Region.

Rosgen, D. L. 1994. A classification of natural rivers. Catena, Vol. 22. No. 3. International Society of Soil Science, Cremligen, Germany

Rice, T.; et al. 1997, SOLO. Computerized documentation of soils information for forests of the Northern Region.

Ruppel, E. T. 1961. Reconnaissance Geologic Map of the Deer Lodge Quadrangle, Powell, Deer Lodge, and Jefferson Counties, Montana. Field Studies Map, MF-174. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:48,000, 1 sheet.

Ruppel, E. T. 1963. Geology of the Basin Quadrangle, Jefferson, Lewis and Clark, and Powell Counties, Montana. U.S.G.S. Bulletin 1151. Washington, D.C.: U.S. Department of Interior, Geological Survey.

Ruppel, E. T.; Oneill, J. M.; and Lopez, D. A. 1993. Geologic map of the Dillon 1 x 2 Quadrangle, Idaho and Montana. Misc. Investigations Series Map 1-1803-H, 1:250,000, U.S. Department of the Interior, Geological Survey, Denver, Colorado

Sahinen, U. M. 1950. Geology and Ore Deposits of the Highland Mountains, Southwestern Montana. Memoir No. 32. Butte, Montana: Bureau of Mines and Geology. Scale 1:63,360, 1 sheet.

Sasich, J. and Lamotte-Hagen, K. 1989. Land System Inventory of the Lolo National Forest. USDA Forest Service, Missoula, Montana

Smedes, H. W. 1962. Preliminary Geologic Map of the Elk Park Quadrangle, Jefferson and Silver Bow Counties, Montana. Mineral Investigations Field Studies Map, MF-246. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:48,000, 1 sheet.

Smedes, H. W. 1967. Preliminary Geologic Map of the Butte South Quadrangle, Montana. Open File Report. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:24,000, 4 sheets.

Smedes, H. W. 1968. Preliminary Geologic Map of Part of the Butte North Quadrangle, Silver Bow, Deer Lodge, and Jefferson Counties, Montana. Open File Report. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:36,000, 1 sheet.

Trowbridge, A. C. 1962. Dictionary of Geological Terms. Garden City, New York. Doubleday, Dolphin Books.

USDA Forest Service. 1970. Soils of the Sheyenne National Grasslands, Richland and Ransom Counties, North Dakota. Custer National Forest. 151 pp.

USDA Forest Service. 1974, Pryor Mountain Ecosystems, Custer National Forest, Revised 1980. 54 pp.

USDA Forest Service. 1975. Background reports for the Rolling Prairie Planning Unit, Little Missouri National Grasslands, Custer National Forest.

USDA Forest Service. 1976. Background reports for the Sioux Planning Unit, Custer National Forest. 221 pp.

USDA Forest Service. 1977. Landtypes of the Beartooth Face Planning Unit, Custer-Gallatin-Shoshone National Forests. 81 pp

USDA Forest Service. 1979. Background reports for the Sheyenne Planning Unit, Custer National Forest. 140 pp.

USDA Forest Service, 1992. Ecological sites and habitat types of the Little Missouri National Grassland and western North Dakota, Draft II. USDA -FS, Northern Region and Custer National Forest. Billings Montana.

USDA Forest Service, 1996. The vegetation of the Sheyenne National Grassland: an ecological classification, Draft I. USDA -FS, Northern Region and Custer National Forest. Billings Montana.

USDA Natural Resources Conservation Service. 1990. STATSGO: State soil geographic data base, Montana. Bozeman, Montana

USDA Natural Resources Conservation Service. 1993. National Soils Handbook. Part 629 Glossary of Landforms. Washington, D.C.

USDA Soil Conservation Service. 1971. Soil Survey of Powder River Area, Montana. 99pp

USDA Soil Conservation Service. 1971. Average Annual Mountain Precipitation Maps. Bozeman, Montana: U.S. Department of Agriculture, Soil Conservation Service. Scale 1:250,000, 4 sheets.

USDA Soil Conservation Service Soil Survey Staff. 1975. Soil Taxonomy.

Agriculture Handbook 436. Washington, D.C. U.S. Government Printing Office.

USDA Soil Conservation Service. 1978. Soil Survey of Slope County, North Dakota. 170pp

USDA Soil Conservation Service. 1980. Soil Survey of Perkins County, South Dakota. 196pp

USDA Soil Conservation Service. 1988. Soil Survey of Harding County, South Dakota. 300pp

USDA Soil Conservation Service. 1988. Soil Survey of Grant County, North Dakota. 173pp

USDA Soil Conservation Service. 1989. Soil Survey of Golden Valley County, North Dakota. 150pp

USDA Soil Conservation Service. 1990. Soil Survey of Ziebach County, South Dakota. 209pp

USDA Soil Conservation Service Soil Survey Division Staff. 1993. Soil Survey Manual. U. S. Department of Agriculture Handbook 18. Washington, D.C. U.S. Government Printing Office.

USDA Soil Conservation Service. 1994. Keys to soil taxonomy. sixth edition.

USDA Soil Conservation Service. 1995. Soil Survey of Corson County, South Dakota. 267pp

Veseth, R. and Montagne. 1980. Geologic Parent Materials of Montana Soils. Montana Agricultural Experiment Station, Montana State University and USDA Soil Conservation Service. Bulletin 721. Bozeman, Montana

Wallace, C. A. et al. 1978. Preliminary Geologic Map of the Northwestern Part of the Butte 1 x 2 Degree Sheet. U.S. Geological Survey Open File Map 78-371. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:250,000 and 1:125,000, 3 sheets.

Wallace, C. A., Lidke, D. J. and J.D. Obrodovich. 1982. Geologic Map of the Sapphire Wilderness and Contiguous Roadless Areas, Granite and Ravalli Counties, Montana. Map MF-1469-A. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:50,000, 1 sheet.

Wanek, A. A. and Barclay, C. S. V. 1966. Geology of the Northwest Quarter of the Anaconda Quadrangle, Deer Lodge County, Montana. Geological Survey Bulletin 1222-B. Washington, D.C.: U.S. Department of Interior, Geological Survey.

Weeks, R. A. 1974. Geologic Map of the Bull Mountain Area, Jefferson County, Montana. Open File Report 74-354. Washington, D.C.: U.S. Department of Interior, Geological Survey. Scale 1:48,000, 1 sheet.

Whipple, J. W. 1990. Geologic map of Glacier National Park, Montana, Map I-1508-F. Department of the Interior. U.S. Geological Survey

Wilson, D. and Coyner, J. 1989. Soil Survey of the Clearwater National Forest Area (in-service report). USDA Forest Service. Orofino, Idaho

Abbreviations Used on Summary Bar Charts

Geologic Materials:

AL	Alluvium,
DS	Deltaic Sediments
GNST	Gneiss, Schist
GR	Granitics
LC	Lacustrine Deposits
LO	Loess
MIX	Mixed Geology
MS	Metasediments
QUCS	Quartzite, Calc-Silicate
SC,	Carbonates
SHSS	Shale, Siltstone, Sandstone
SSED	Soft Sedimentary
SSSH	Sandstone, Shale
TSED	Tertiary Sediments
VOL	Volcanics
WSD	Wind Deposited Sediments

Landforms:

BA	Badlands
BK	Breaks
BKMW	Breaks
CODP	Colluvial Deposits
DIBK	Breaks
DIPL	Dissected Plains
ERUP	Eroded Uplands
MORI	Frost-Shattered Mountain Ridges
GLDIPL	Dissected Glaciated Plains
GLLAPL	Glaciated Lacustrine Plains
GLMS	Glaciated Mountain Slopes
GLMSRI	Glaciated Mountain Slopes and Ridges
GLPL	Glaciated Plains
HIDU	Hills and Dunes
HIPT	Hills and Plateaus
HRMS	High Relief Mountain Slopes
LOHILL	Low Relief Hills
MSRI	Mountain Slopes and Ridges
MSRIMW	Mountain Slopes and Ridges, Moderately Weathered
MWSL	Mass Wasted Slopes
PED	Pediment
PL	Plains
PTBT	Erosional Plateaus and Buttes
STGLMS	Steep Glaciated Mountain Slopes
TR	Glacial Troughs and Trough Walls
VA	Valleys

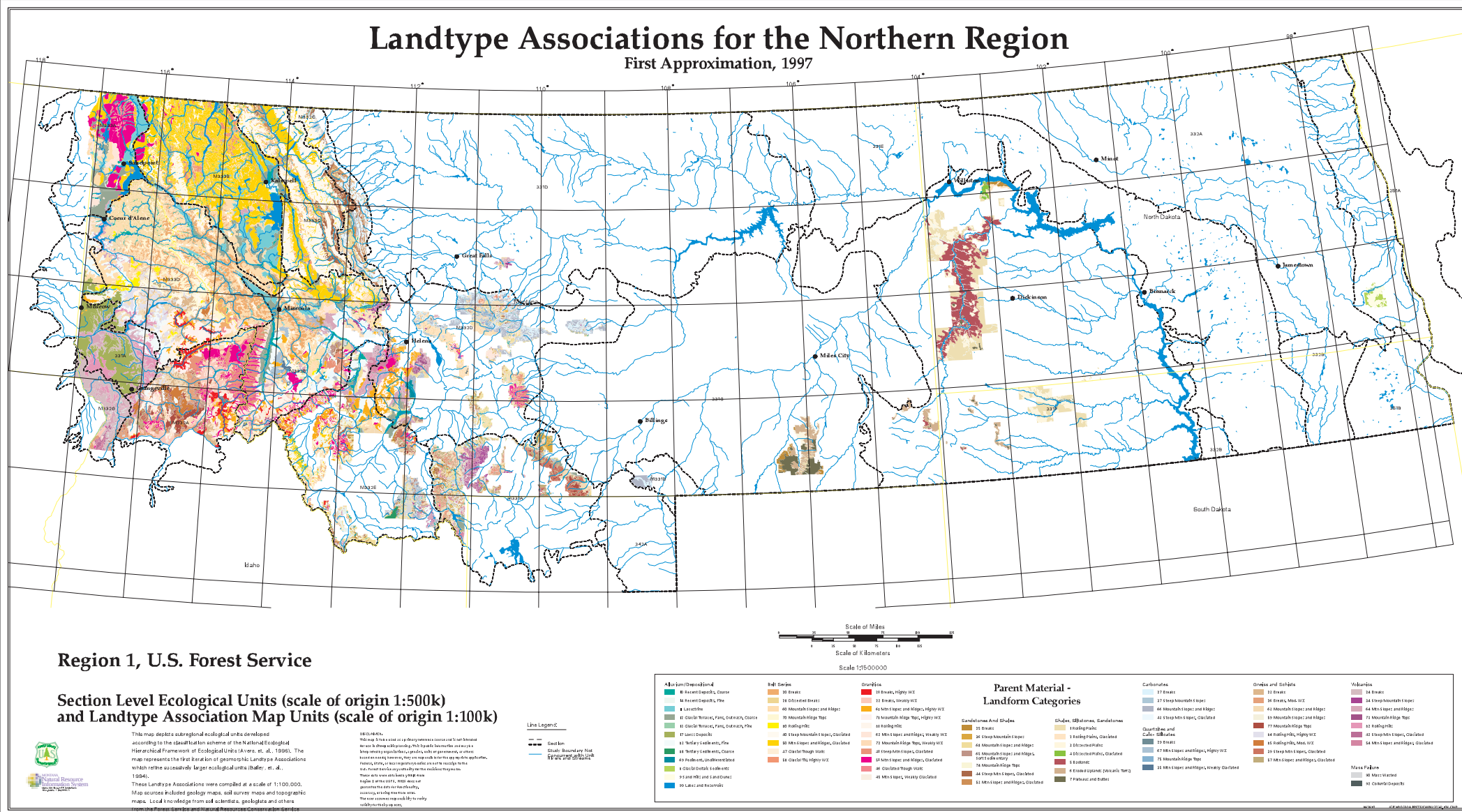
Introducing SOLO:

Interactive decision support software for SOil quality monitoring and LOng term ecosystem sustainability.

WHAT IS SOLO?

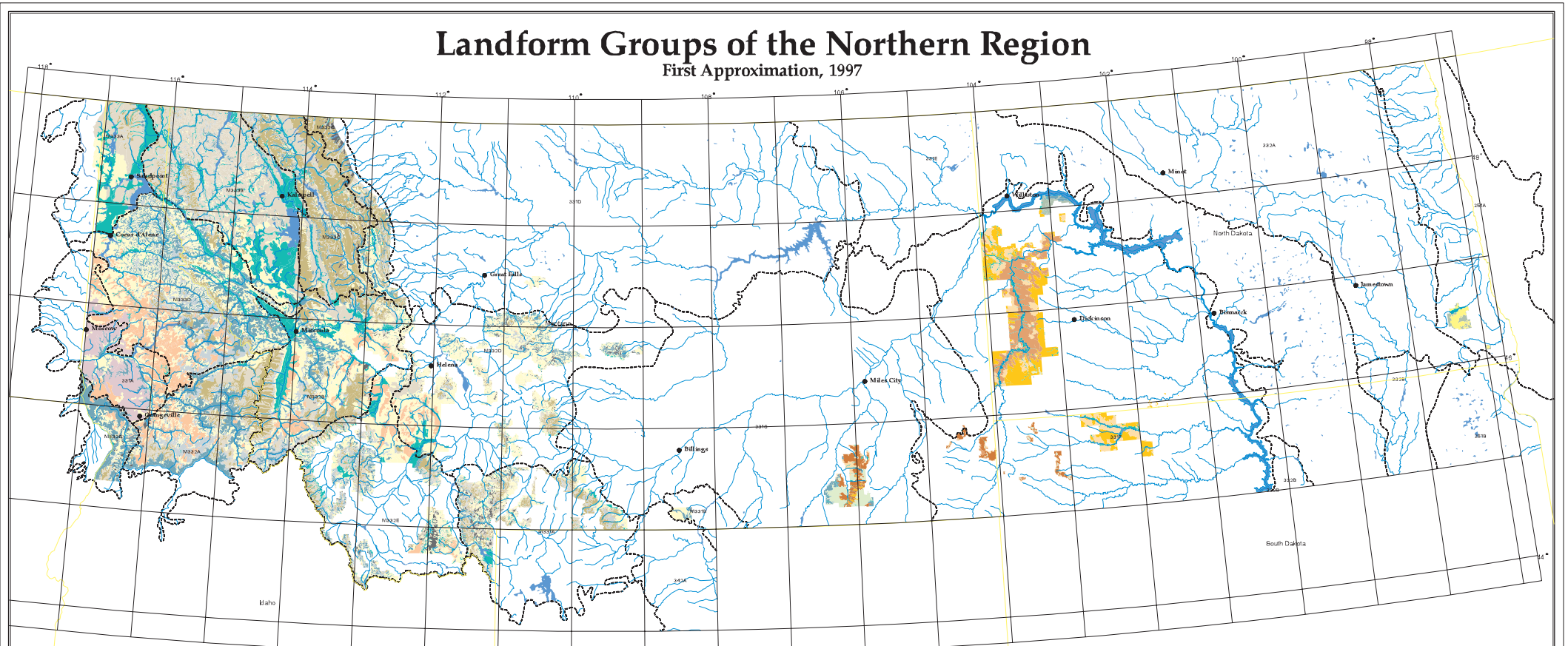
SOLO is a computerized collection of representative documentation on soil monitoring and long term ecosystem sustainability, linked together electronically by topic, author, key word or phrase and similar geography. The information may be surveyed by activating 'push-buttons' on the computer screen.

Figure 1



Landform Groups of the Northern Region

First Approximation, 1997



Region 1, U.S. Forest Service

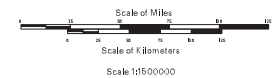
Section Level Ecological Units (scale of origin 1:500k) and Landtype Association Map Units (scale of origin 1:100k)

This map depicts a subregional ecological units developed according to the classification scheme of the National Hierarchical Framework of Ecological Units (Auer, et al., 1998). The map represents the first iteration of geomorphic Landtype Associations for the Northern Region.

These Landtype Associations were compiled at a scale of 1:100,000. Map sources included geologic, soil survey, and topographic maps, and the knowledge of soil scientists, geologists and others from the Forest Service and Natural Resources Conservation Service.

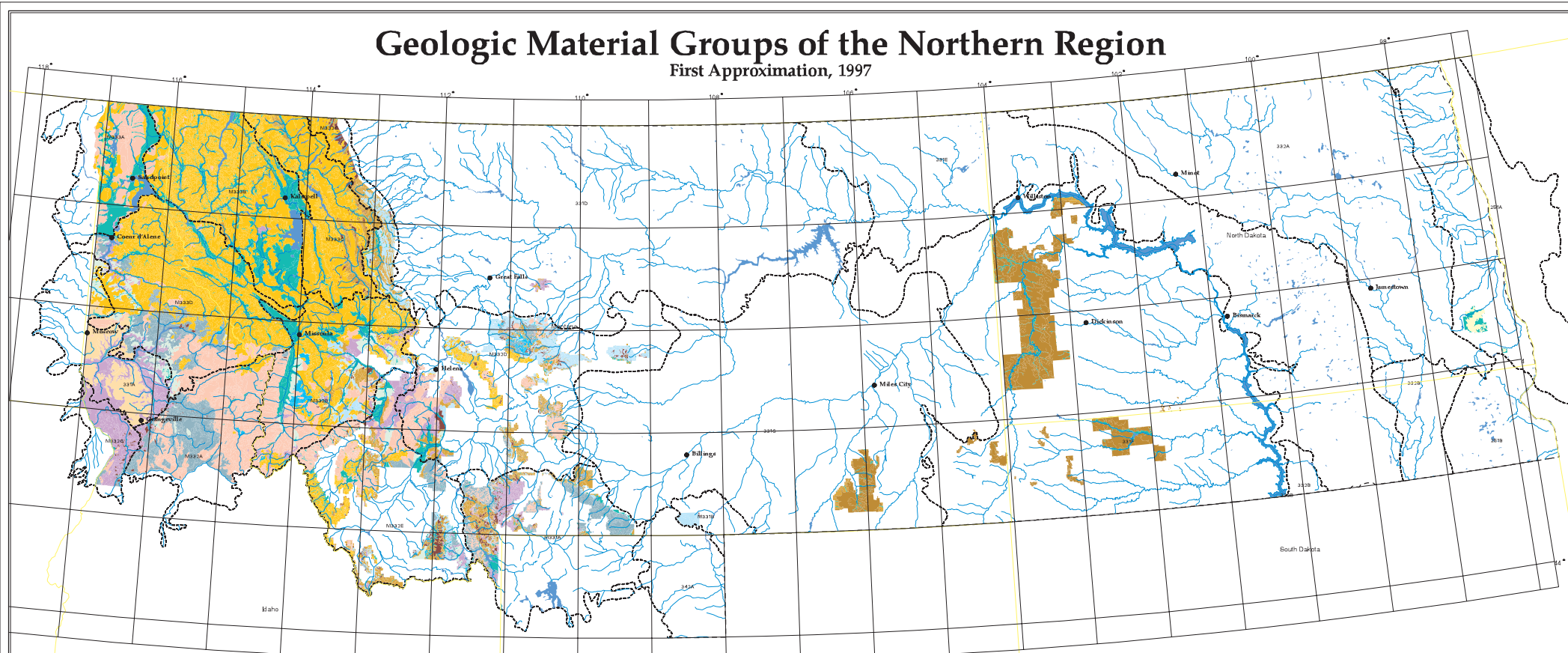
Landform Legend:

Valleys	Steep Glaciated Mountain Slopes	Sand Hills and Sand Dunes
Breaks	Mass Wasted Slopes and Colluvial Deposits	Erosional Plateaus and Buttes
Low Relief Hills	Plains	Water
Hills and Plateaus	Dissected Plains	Section
Mountain Slopes and Ridges	Glaciated Plains	State Boundary Not Consistent with UTM
Front-Stratified Mountain Ranges	Barrenlands	Rivers and Streams
Glaciated Mountain Slopes and Ridges	Eroded Uplands	State Border



Geologic Material Groups of the Northern Region

First Approximation, 1997



Region 1, U.S. Forest Service

Section Level Ecological Units (scale of origin 1:500k) and Landtype Association Map Units (scale of origin 1:100k)

This map depicts a subregional ecological unit developed according to the classification scheme of the National Hierarchical Framework of Ecological Units (Auer, et al., 1998). The map represents the first iteration of geologic Landtype Associations for the Northern Region.

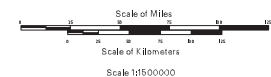
These Landtype Associations were compiled at a scale of 1:100,000. Map sources included geologic, soil survey, and topographic maps, and the knowledge of soil scientists, geologists and others from the Forest Service and Natural Resources Conservation Service.

NOTES:
No warranty is made by the U.S. Forest Service for use of the map for purposes other than those for which it was developed. The map is not intended to be used for navigation or other purposes. The map is not intended to be used for navigation or other purposes. The map is not intended to be used for navigation or other purposes.

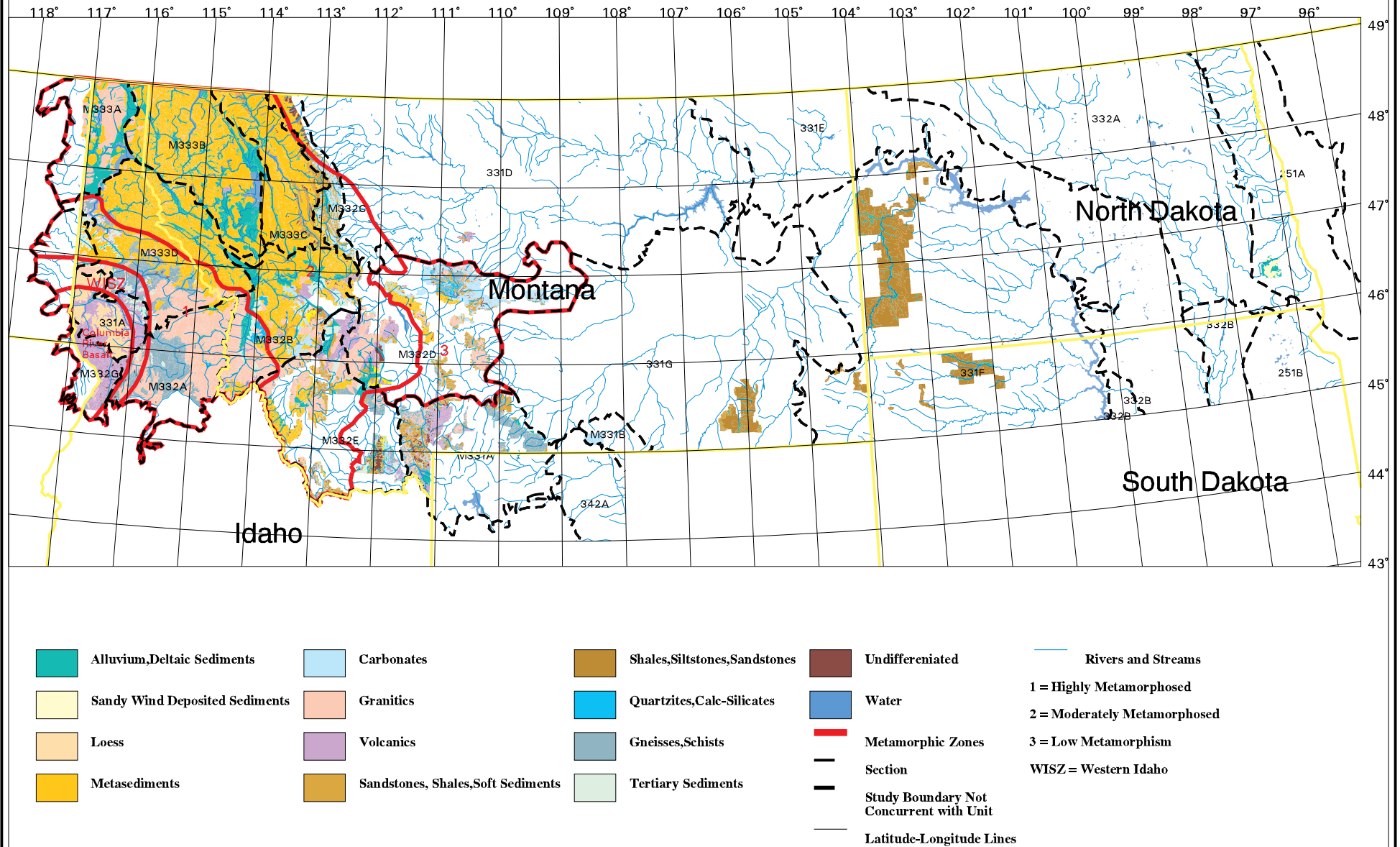
Line Legend:
--- Section
--- Study Boundary Not Consistent with Unit
--- Rivers and Streams
--- State Border

Geologic Material Legend:

Alkaline, Dabatic Sediments	Sandstones, Shales, Soft Sediments
Sandy Wind Deposited Sediments	Shales, Siltstones, Sandstones
Lenses	Quartzites, Calc-Siltstones
Metasediments	Gneisses, Schists
Carbonates	Tertiary Sediments
Diorites	Unfractured Land
Volcanics	Water



GEOLOGIC MATERIAL-Metamorphic Units for Northern Region



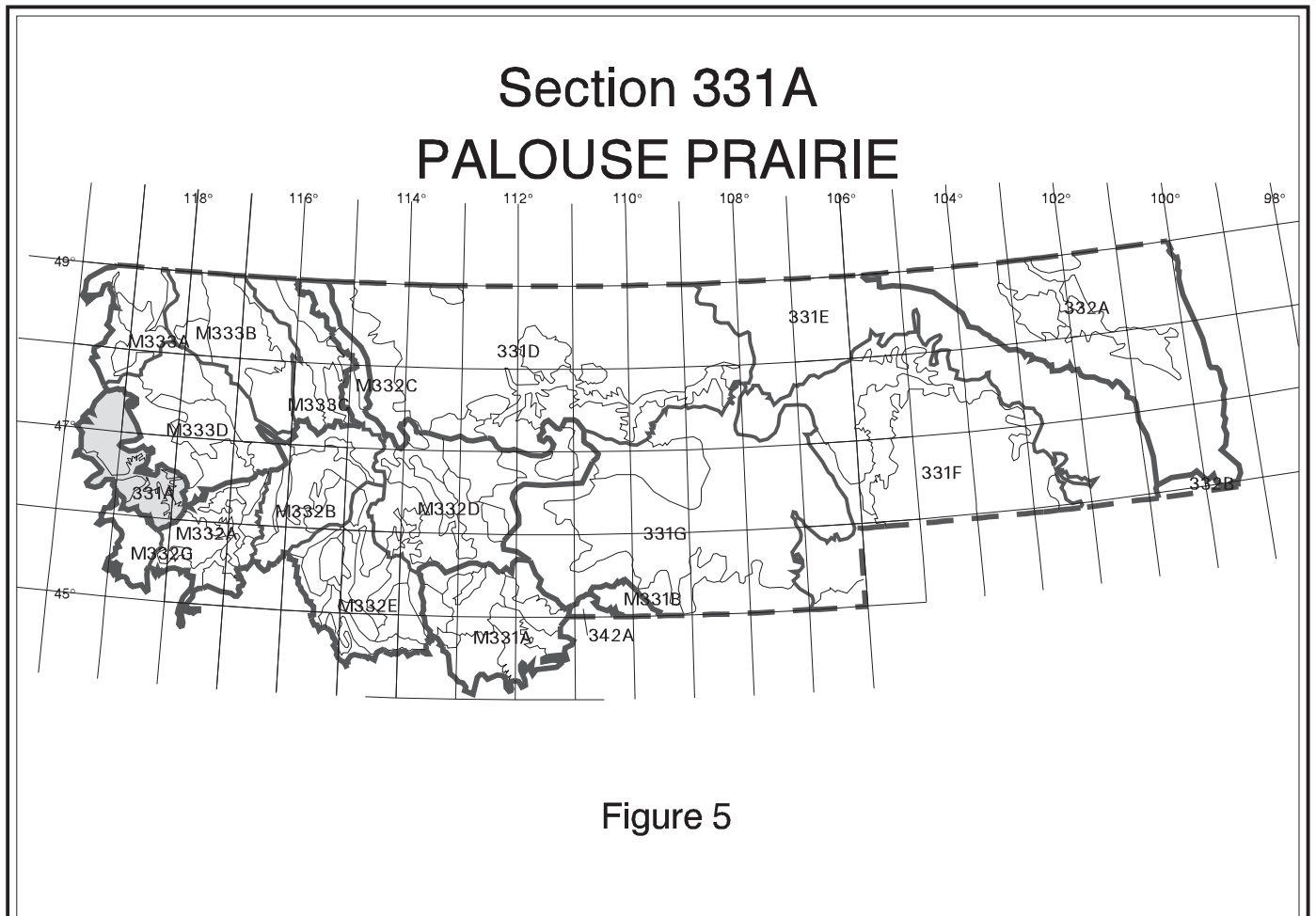
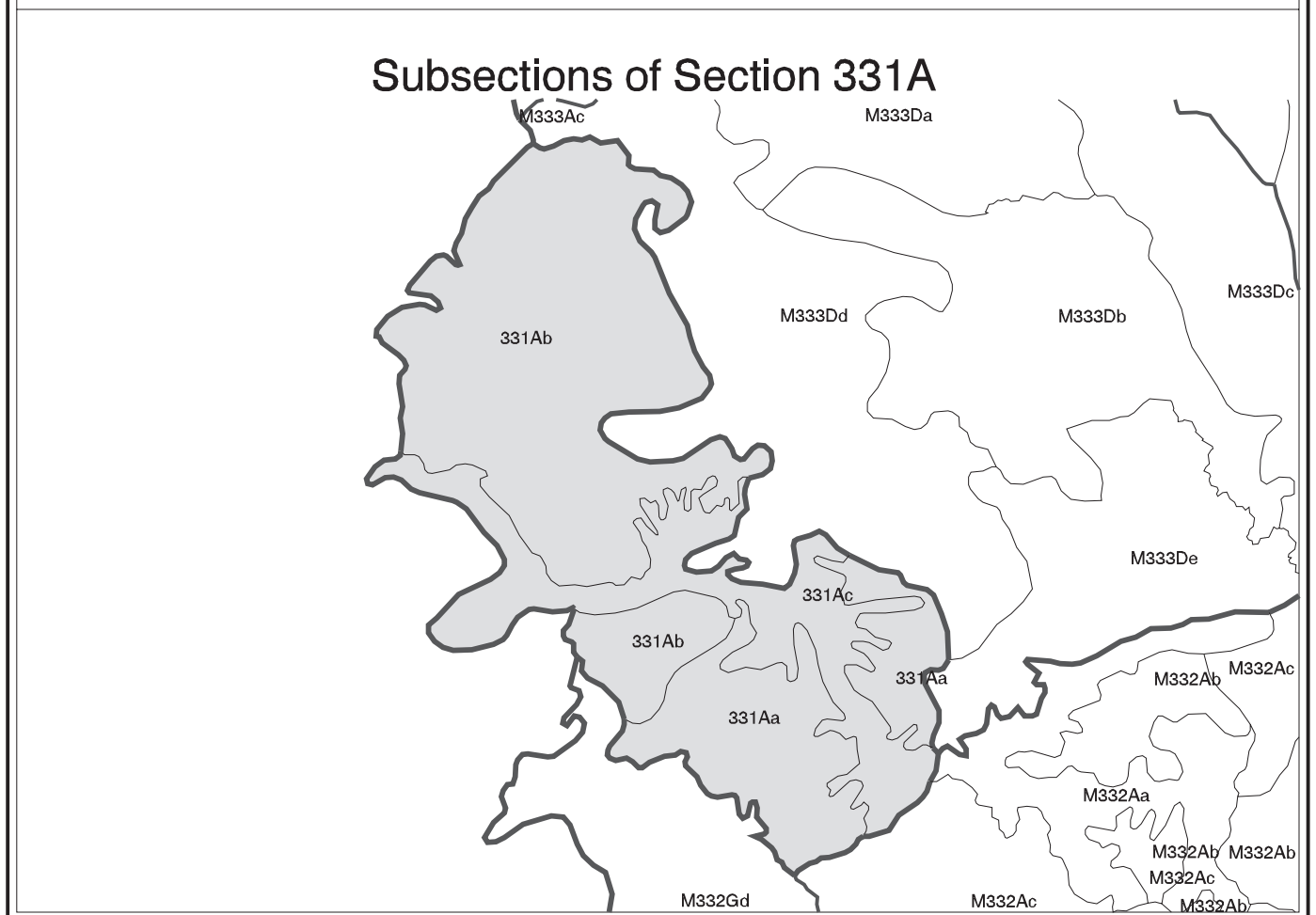


Figure 5



Section 331A



Palouse Prairie Clearwater N.F.

Section 331A PALOUSE PRAIRIE

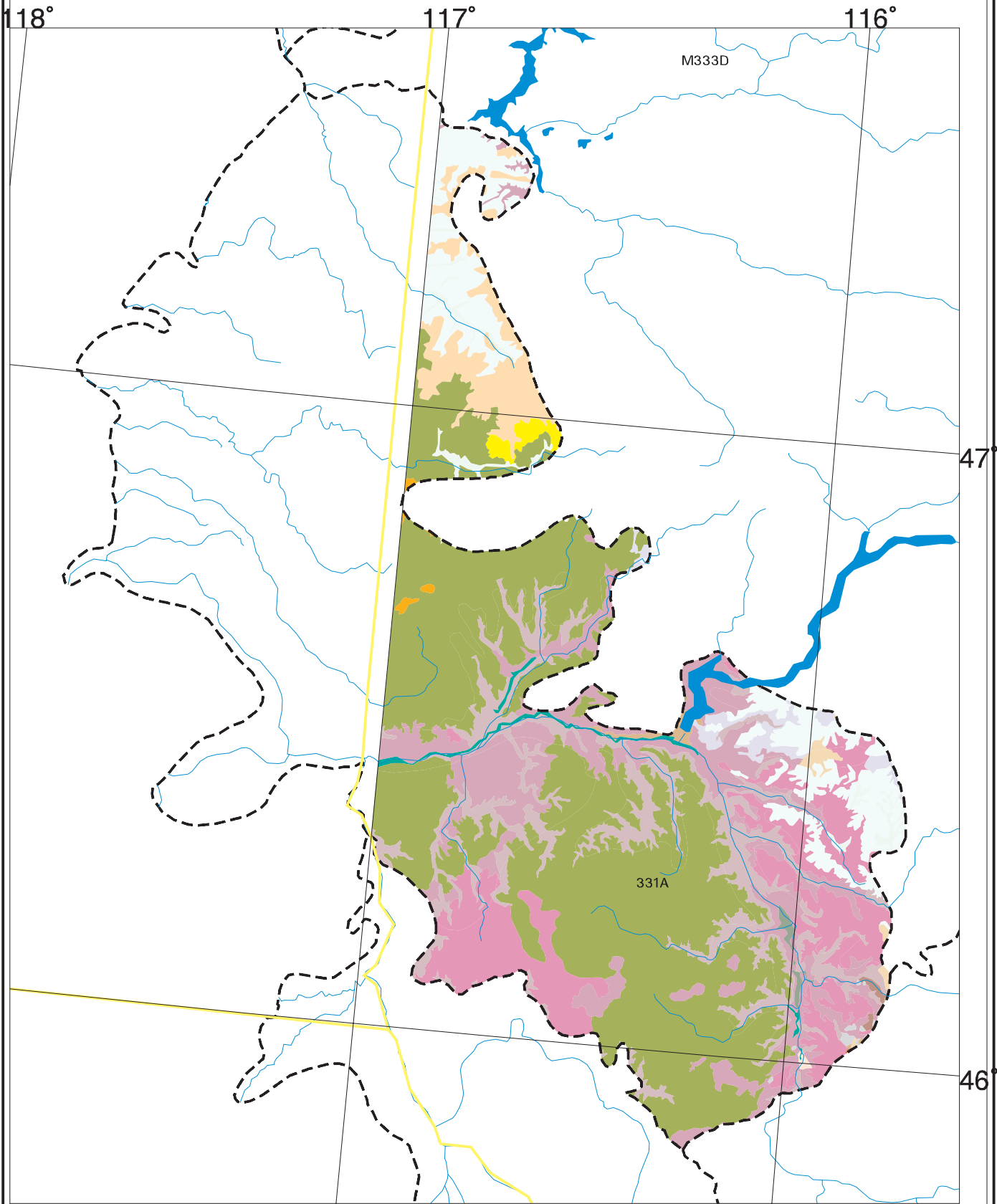
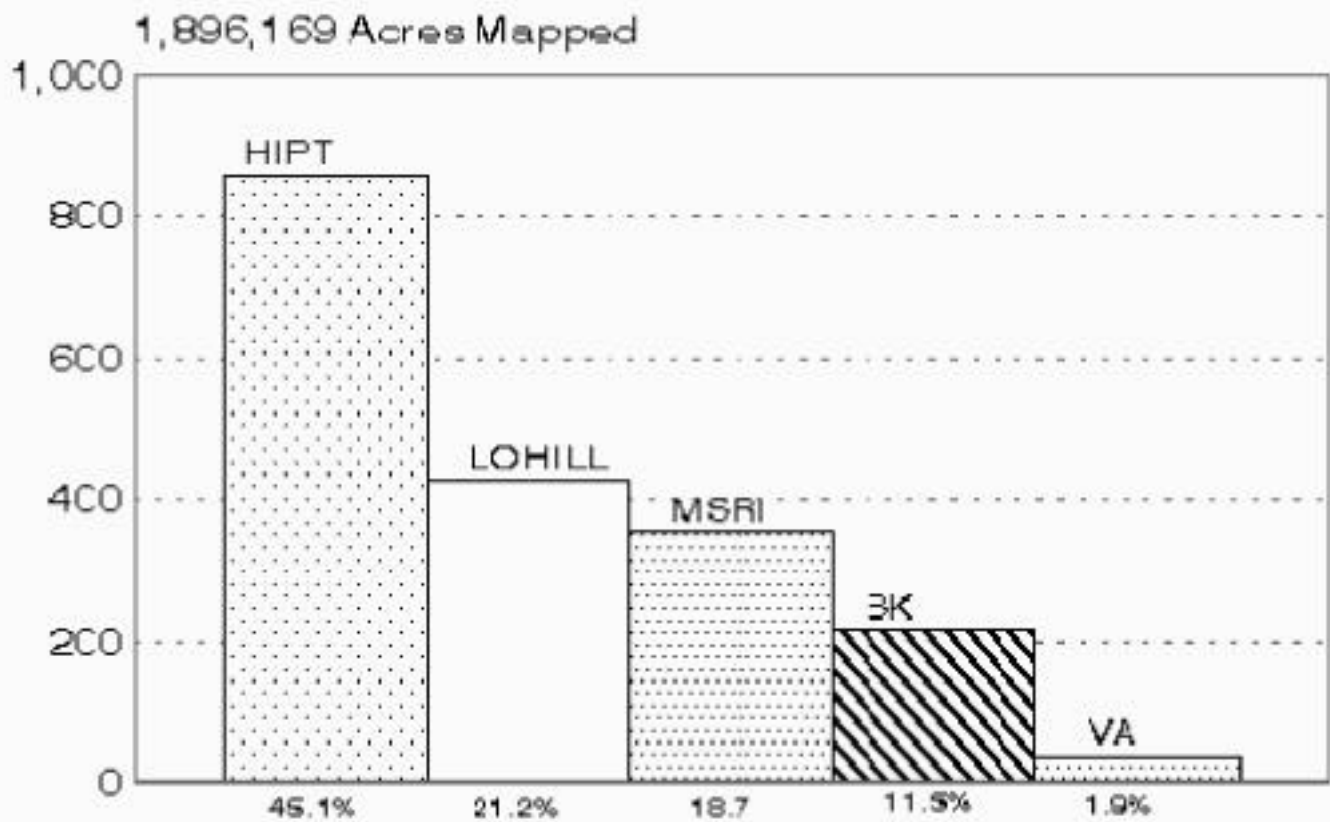


Figure 7

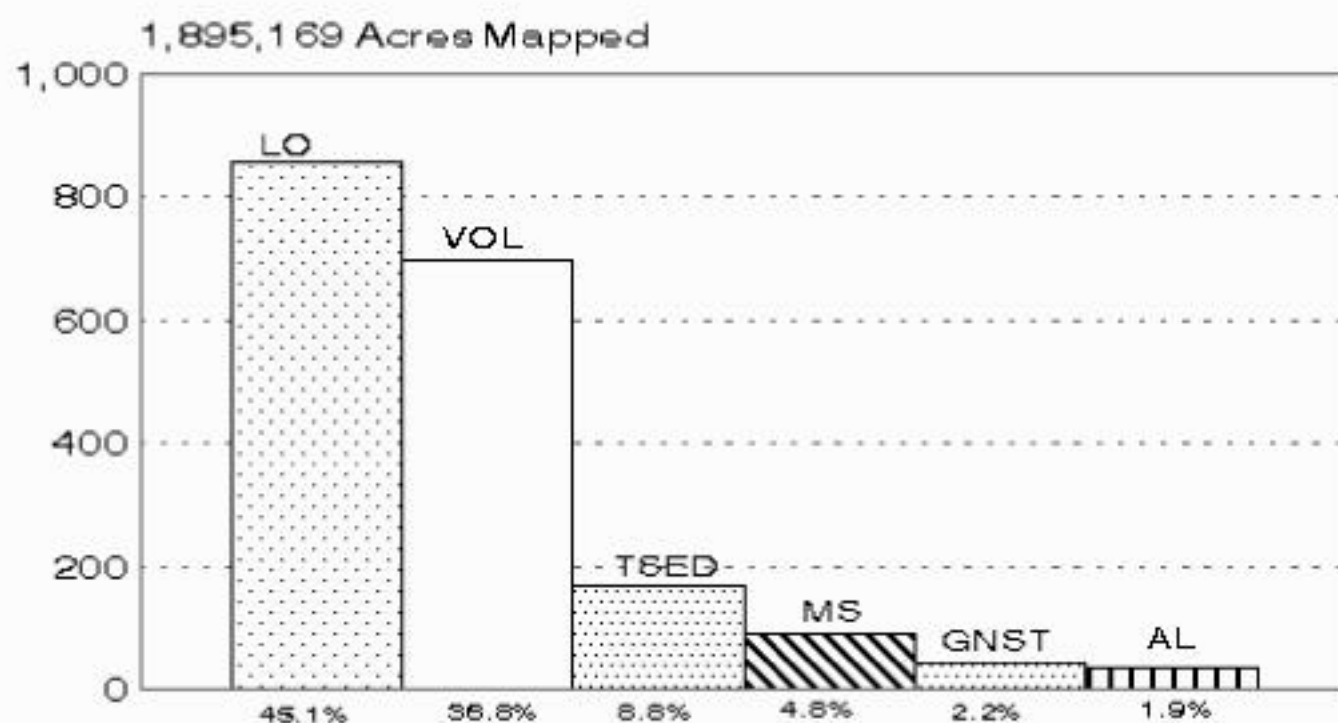
Section 331A: Palouse Prairie

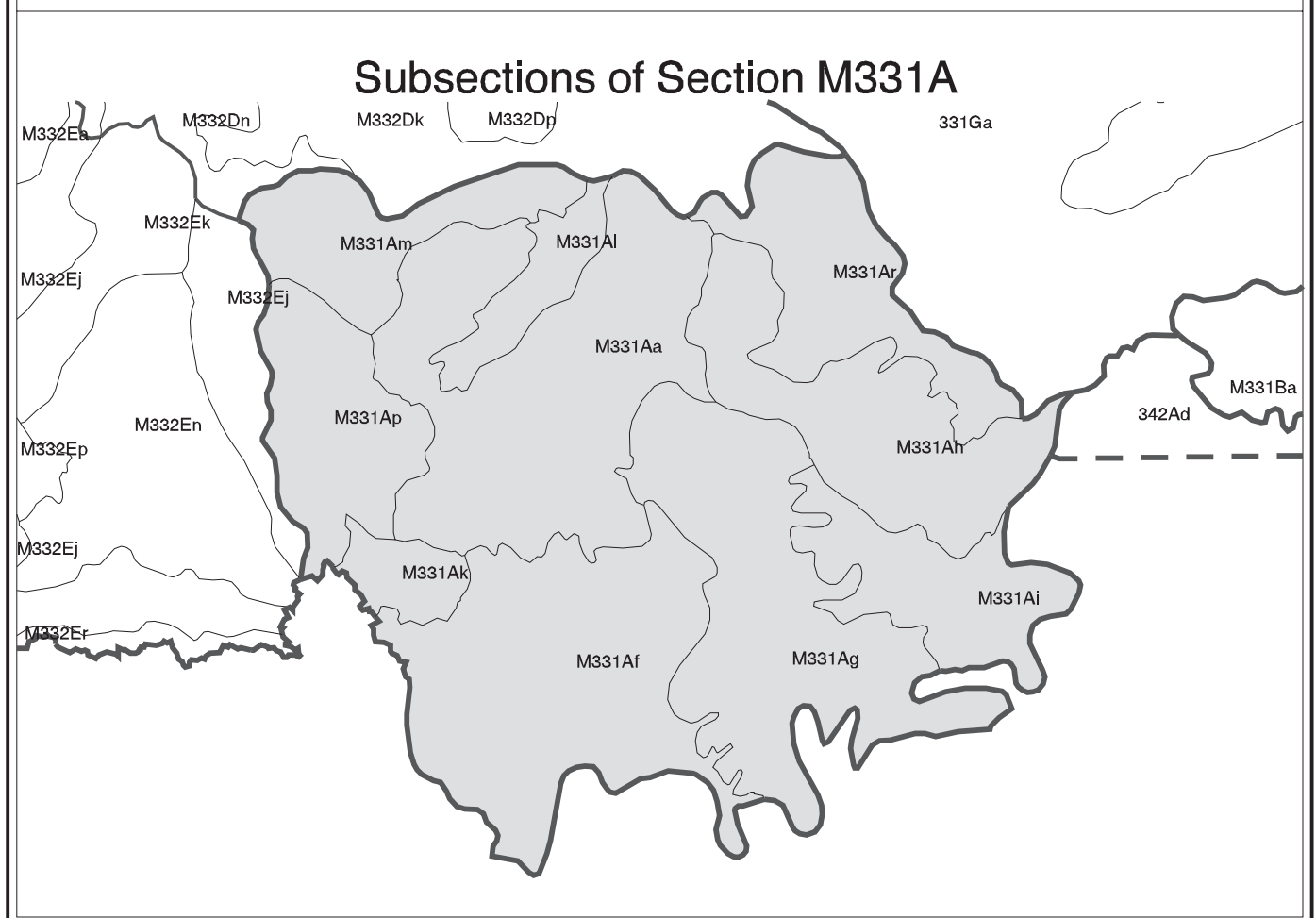
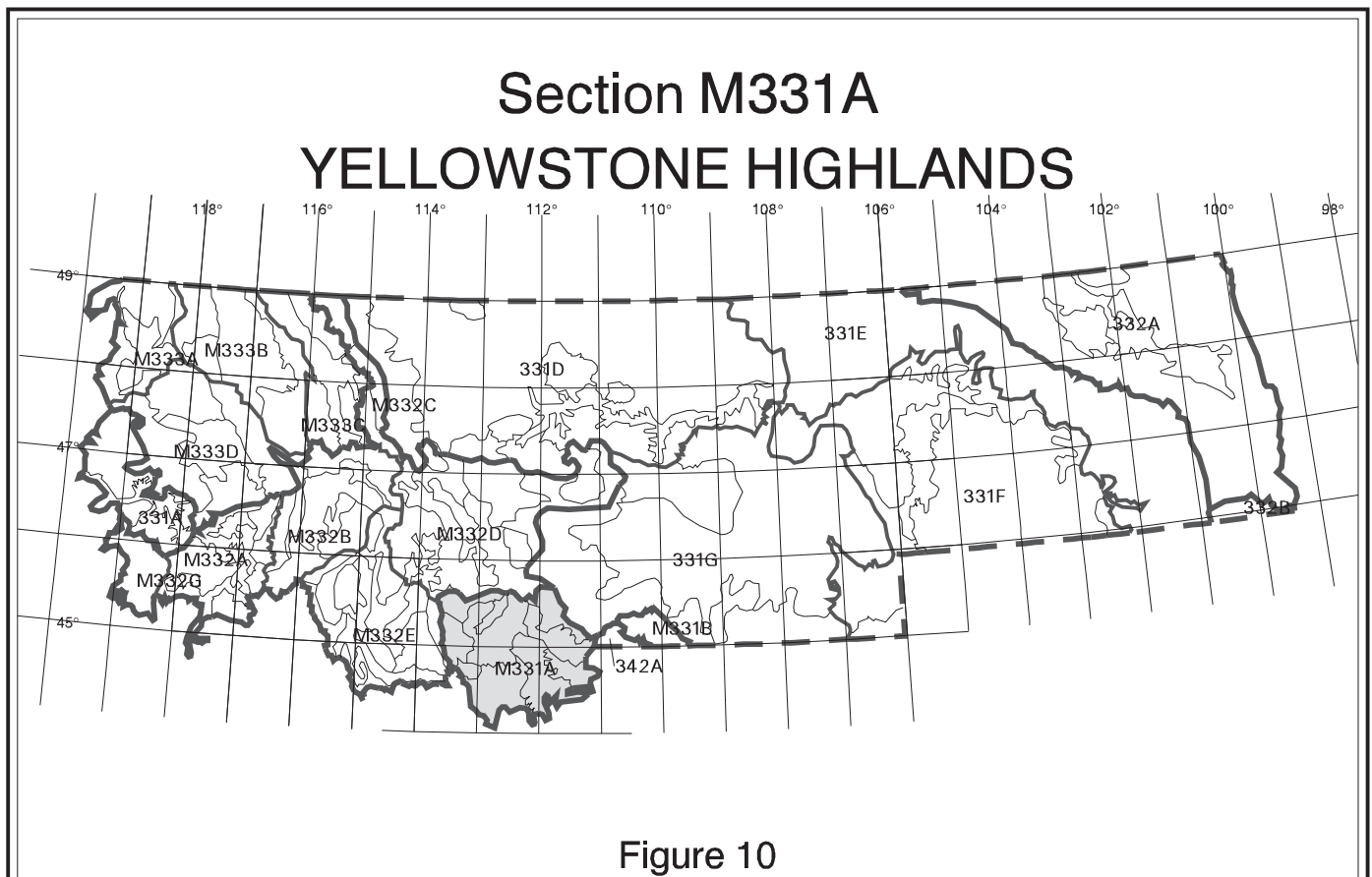
Landform Composition: Acres Mapped 58.4% of Total



Section 331A: Palouse Prairie

Parent Material Composition: Acres Mapped 58.4% of Total





Section M331A



Yellowstone National Park

Section M331A YELLOWSTONE HIGHLANDS

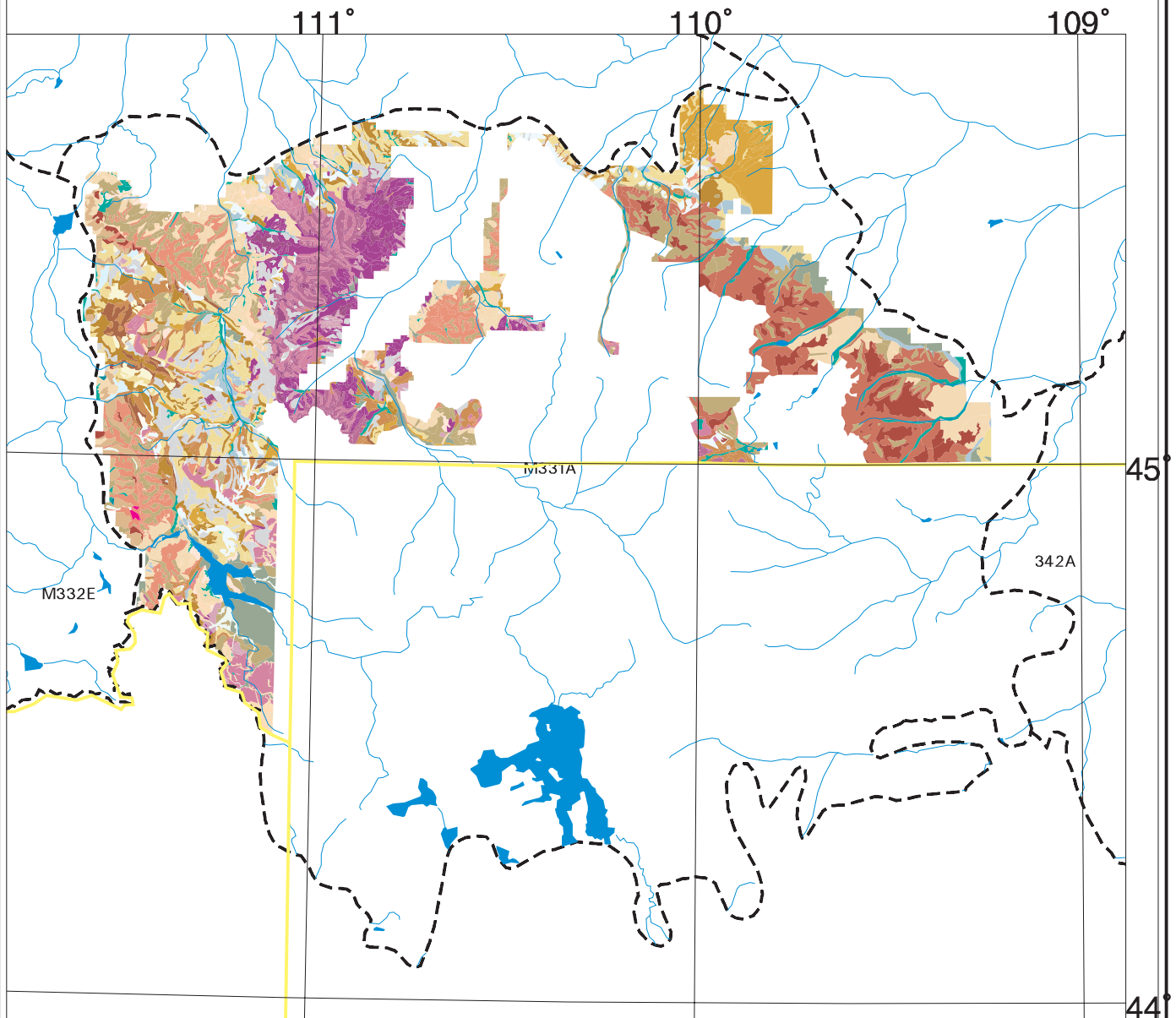
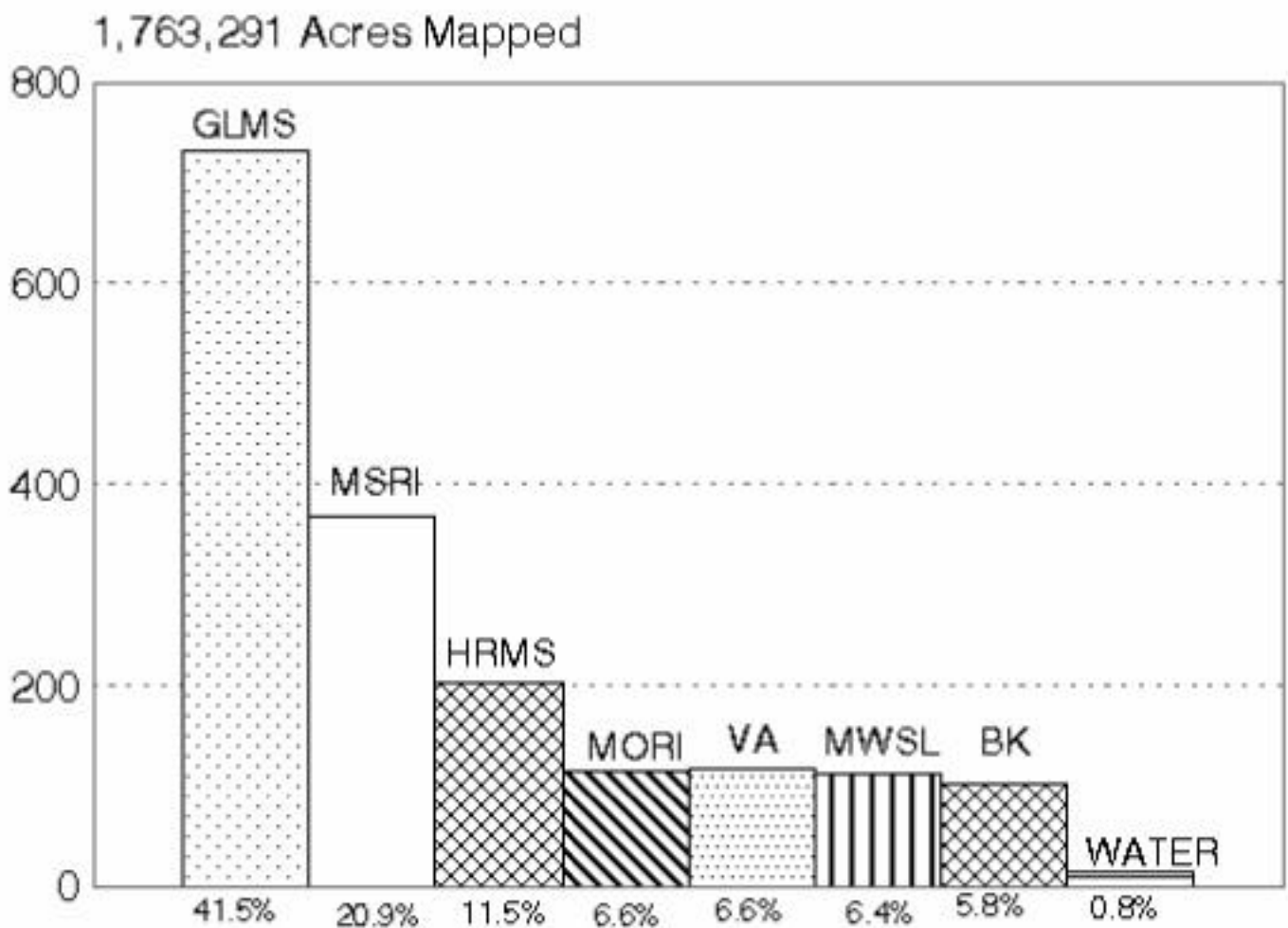


Figure 12

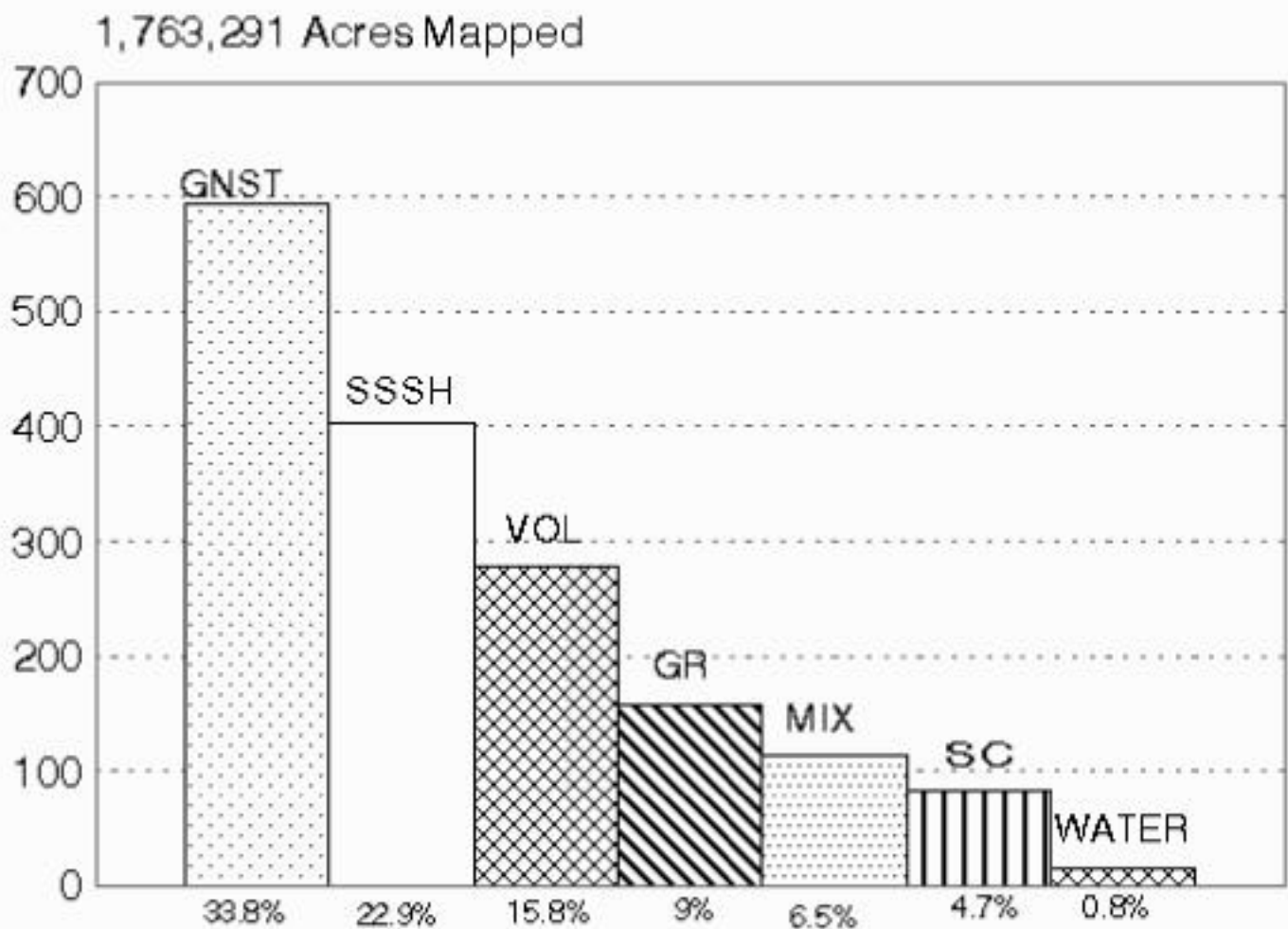
Section M331A: YELLOWSTONE HIGHLANDS

Landform Composition: Acres Mapped 28% of Total



Section M331A:YELLOWSTONE HIGHLANDS

Parent Material Composition: Acres Mapped 28% of Total





Subsections of Section M332A



Section M332A



Bitterroot Range Bitterroot N.F.

Section M332A IDAHO BATHOLITH

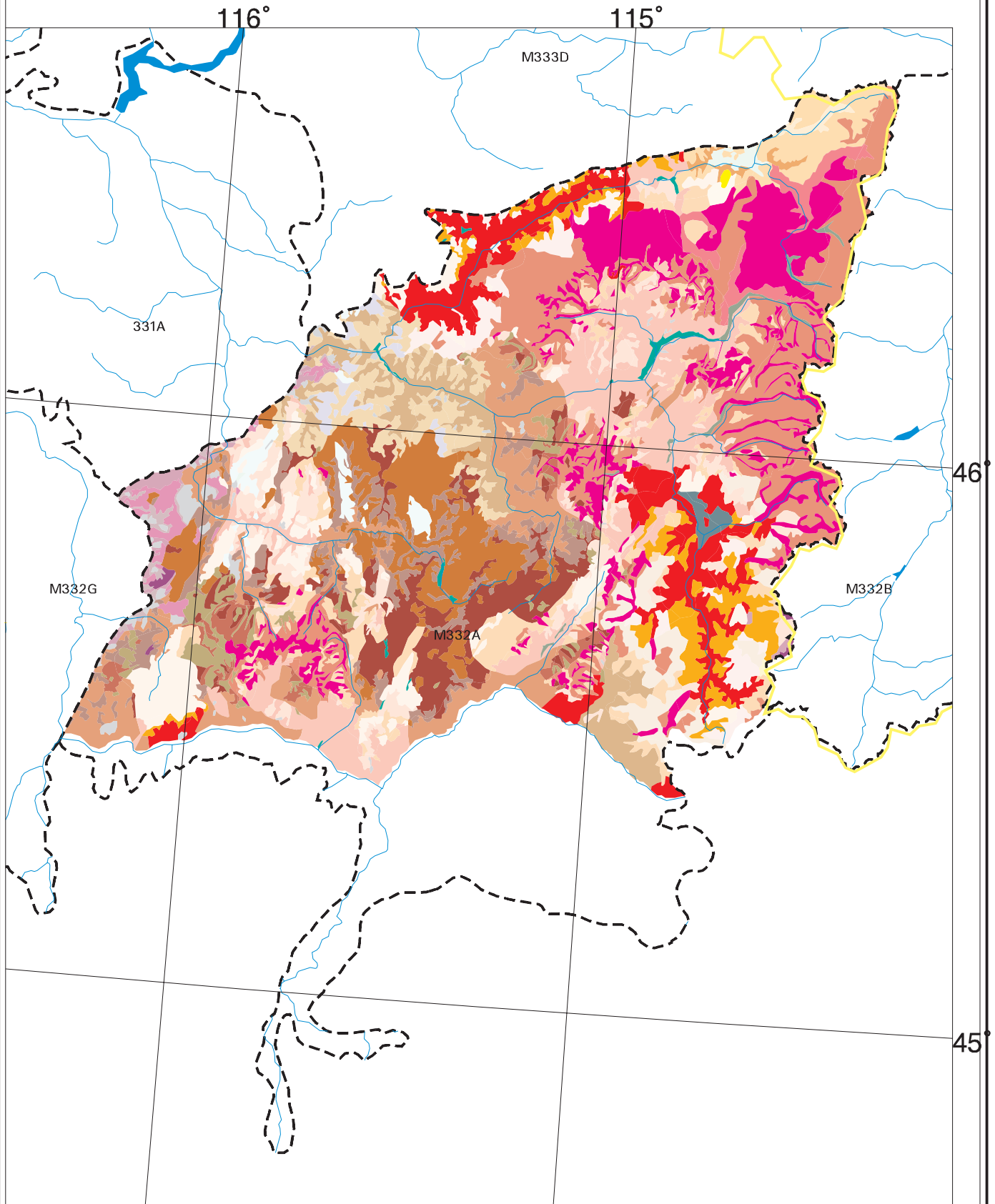
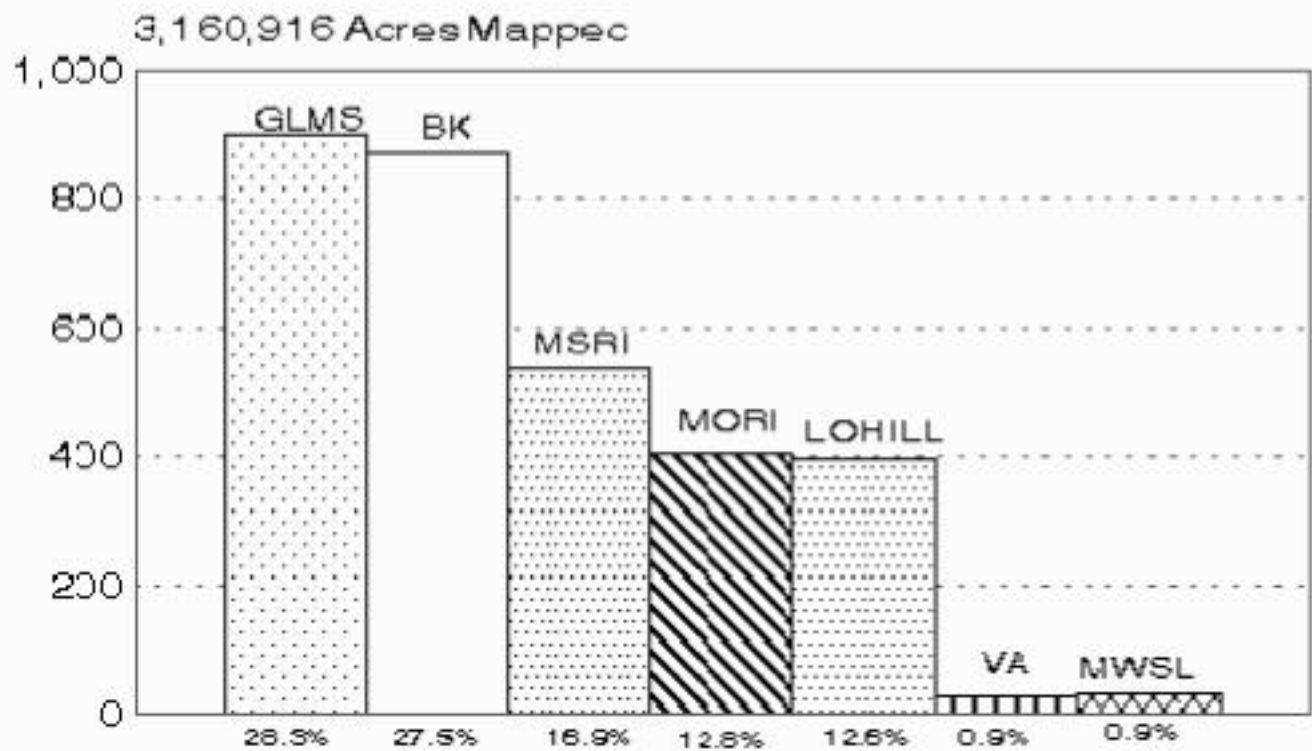


Figure 17

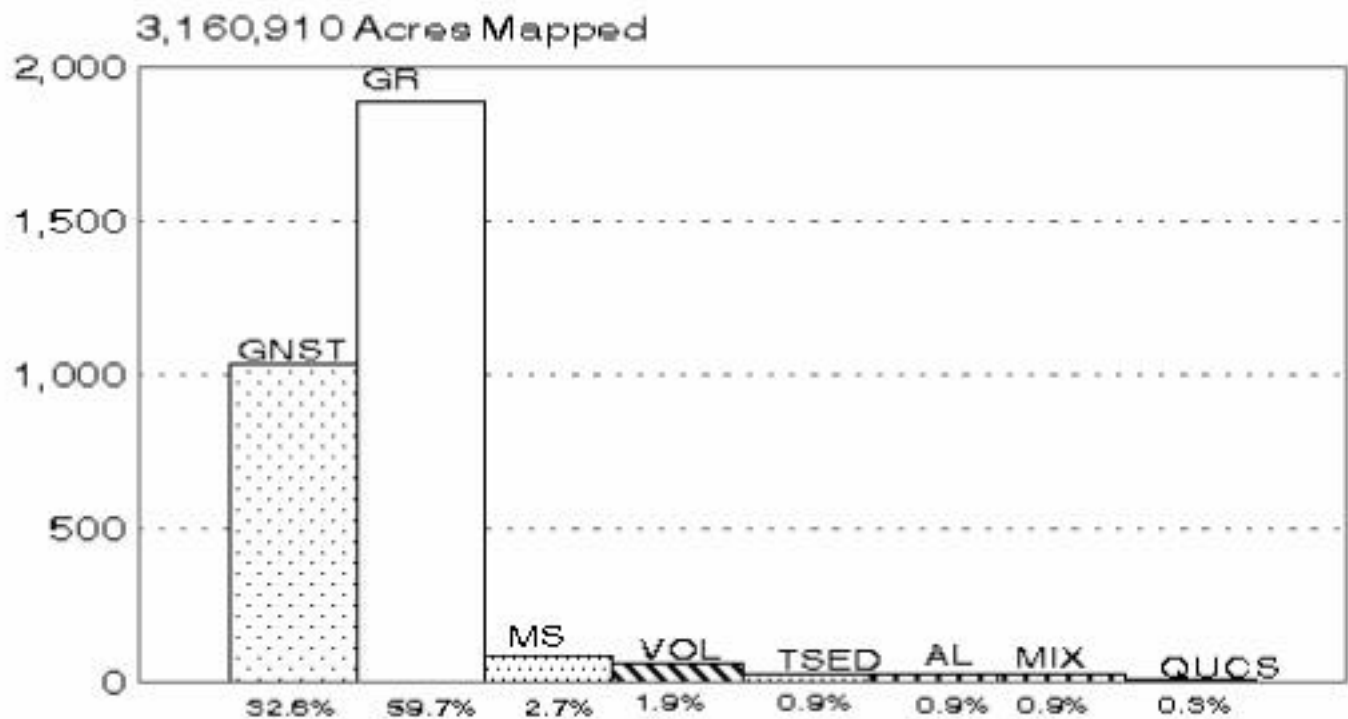
Section M332A: IDAHO BATHOLITH

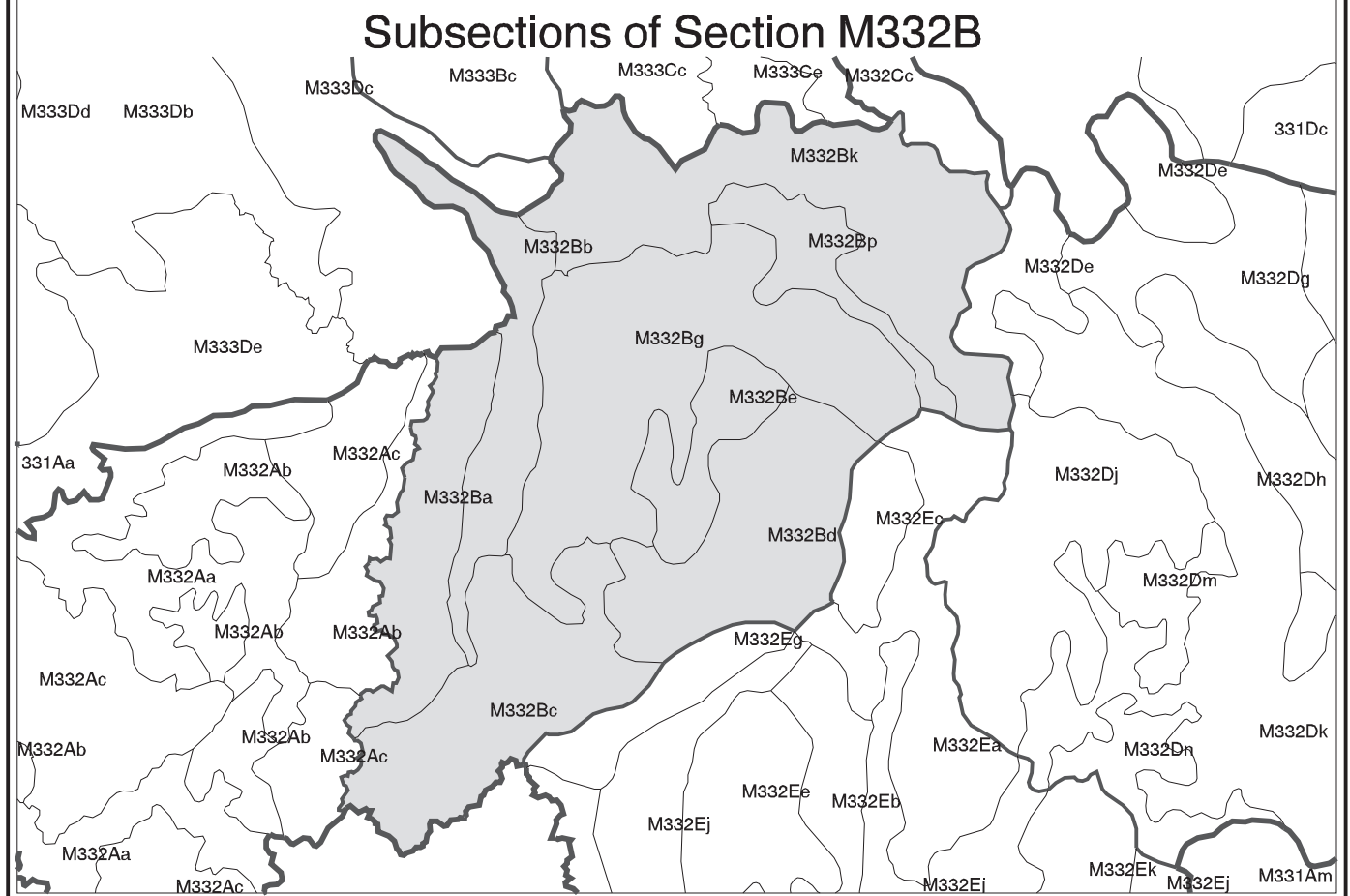
Landform Composition: Acres Mapped 81% of Total



Section M332A: IDAHO BATHOLITH

Parent Material Composition: Acres Mapped 81 % of Total





Section M332B



Glaciated Granitic Mountains Bitterroot N.F.

Section M332B BITTERROOT VALLEY

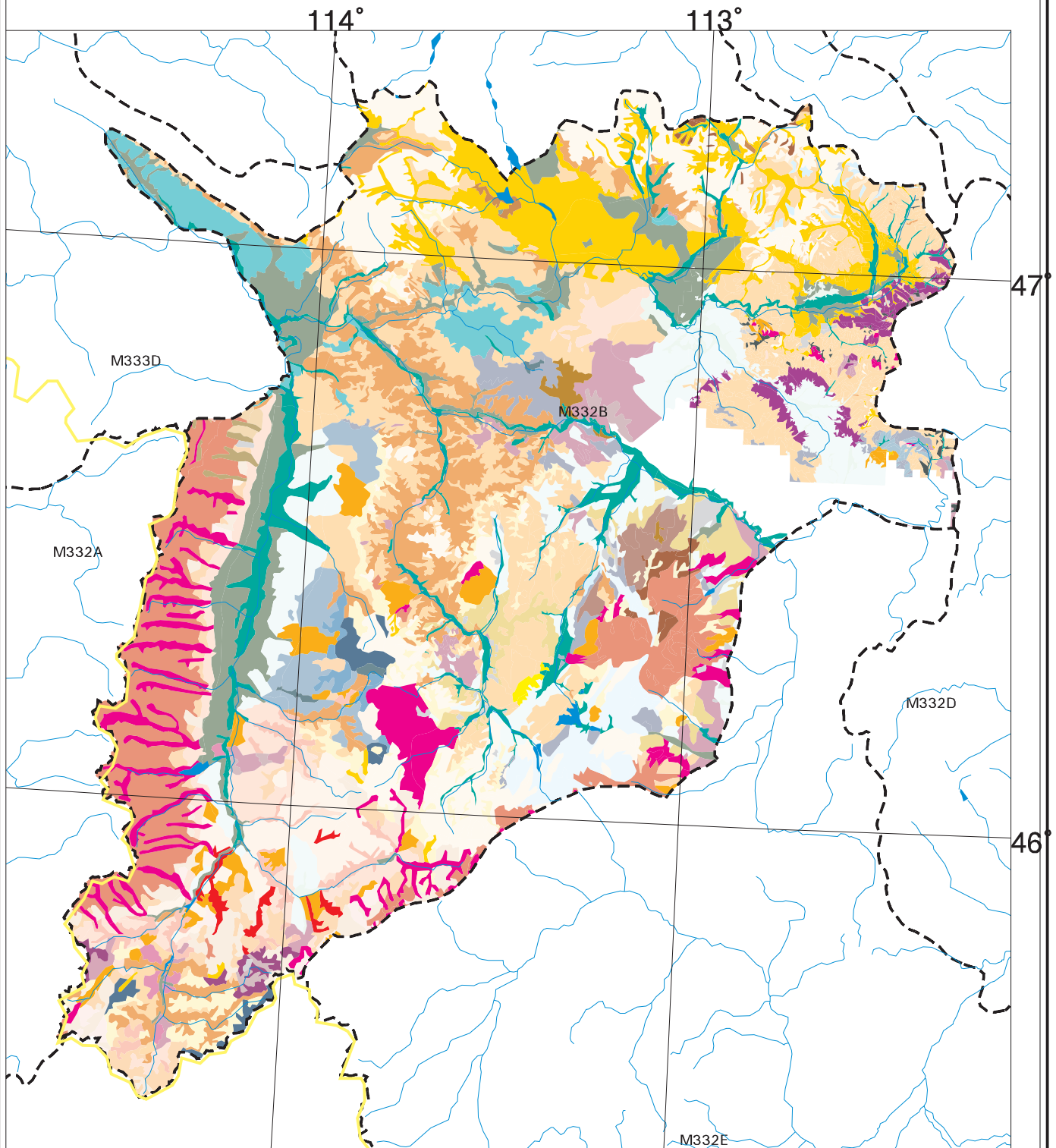
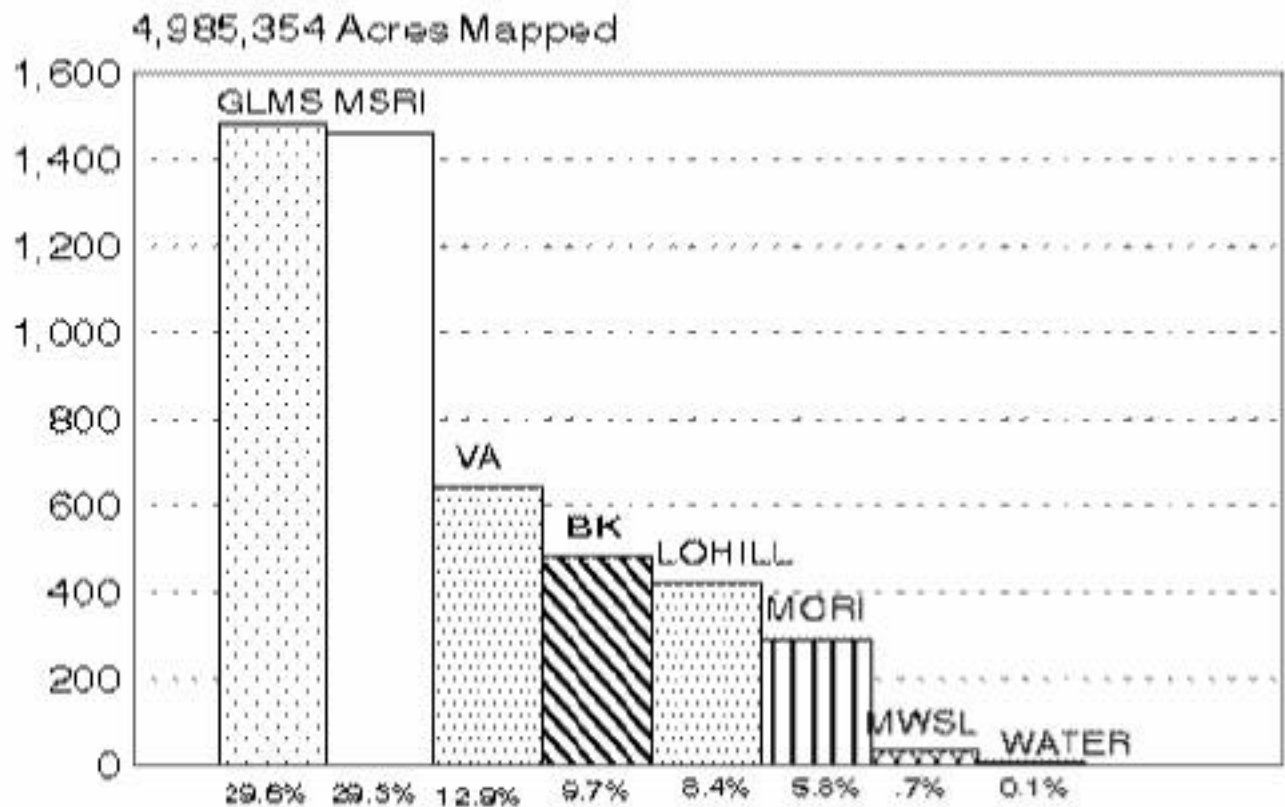


Figure 22

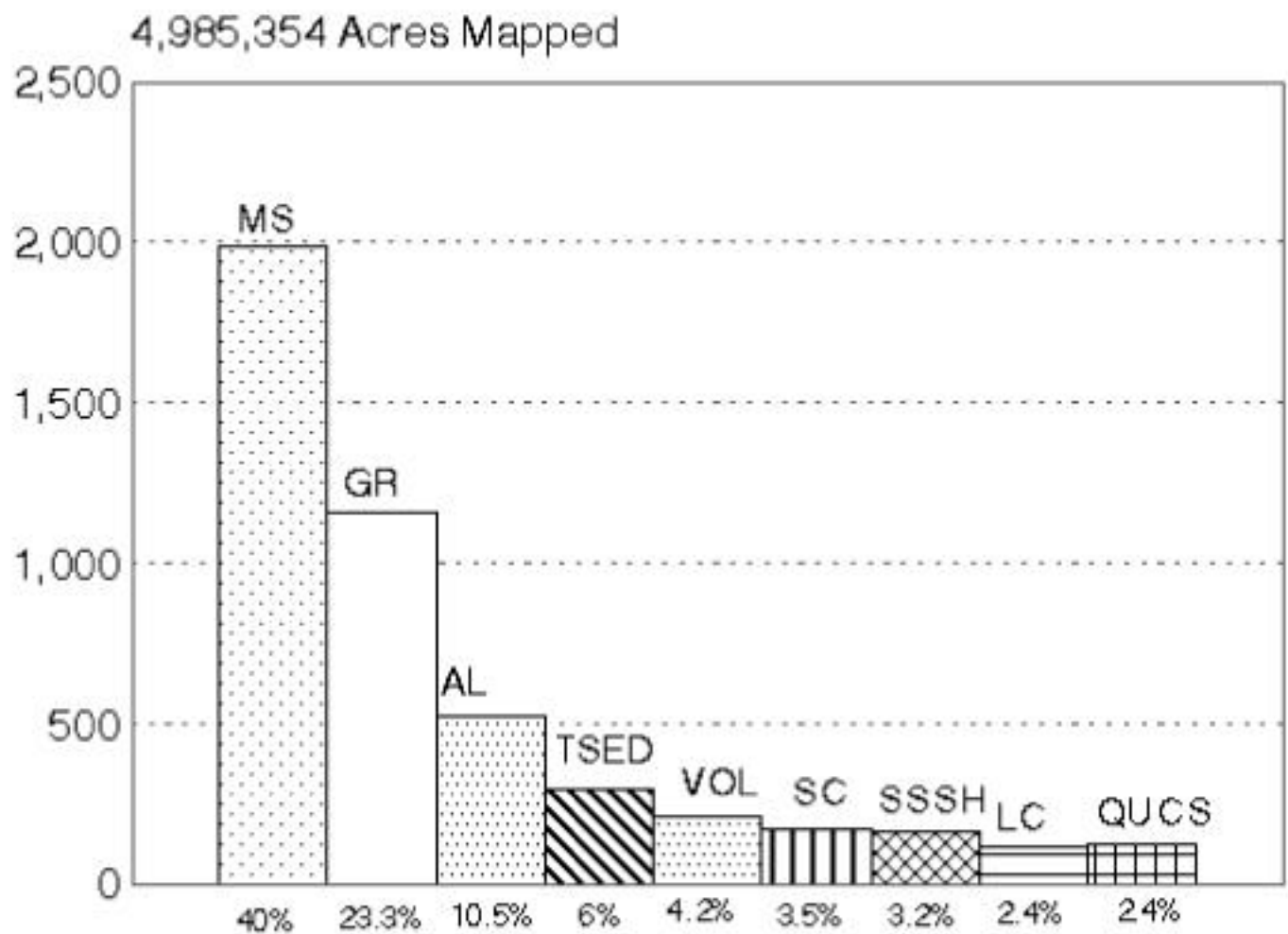
Section M332B: BITTERROOT VALLEY

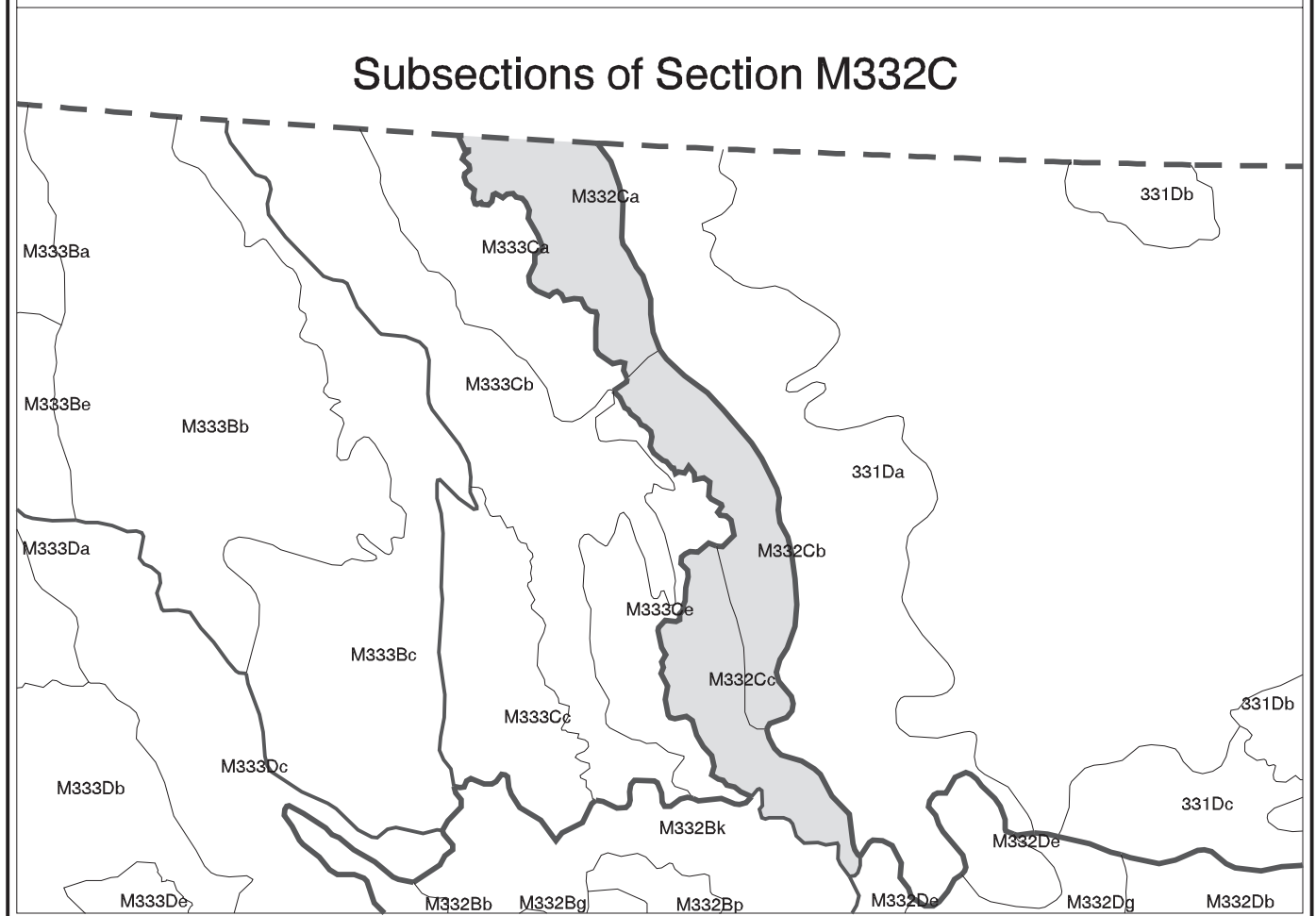
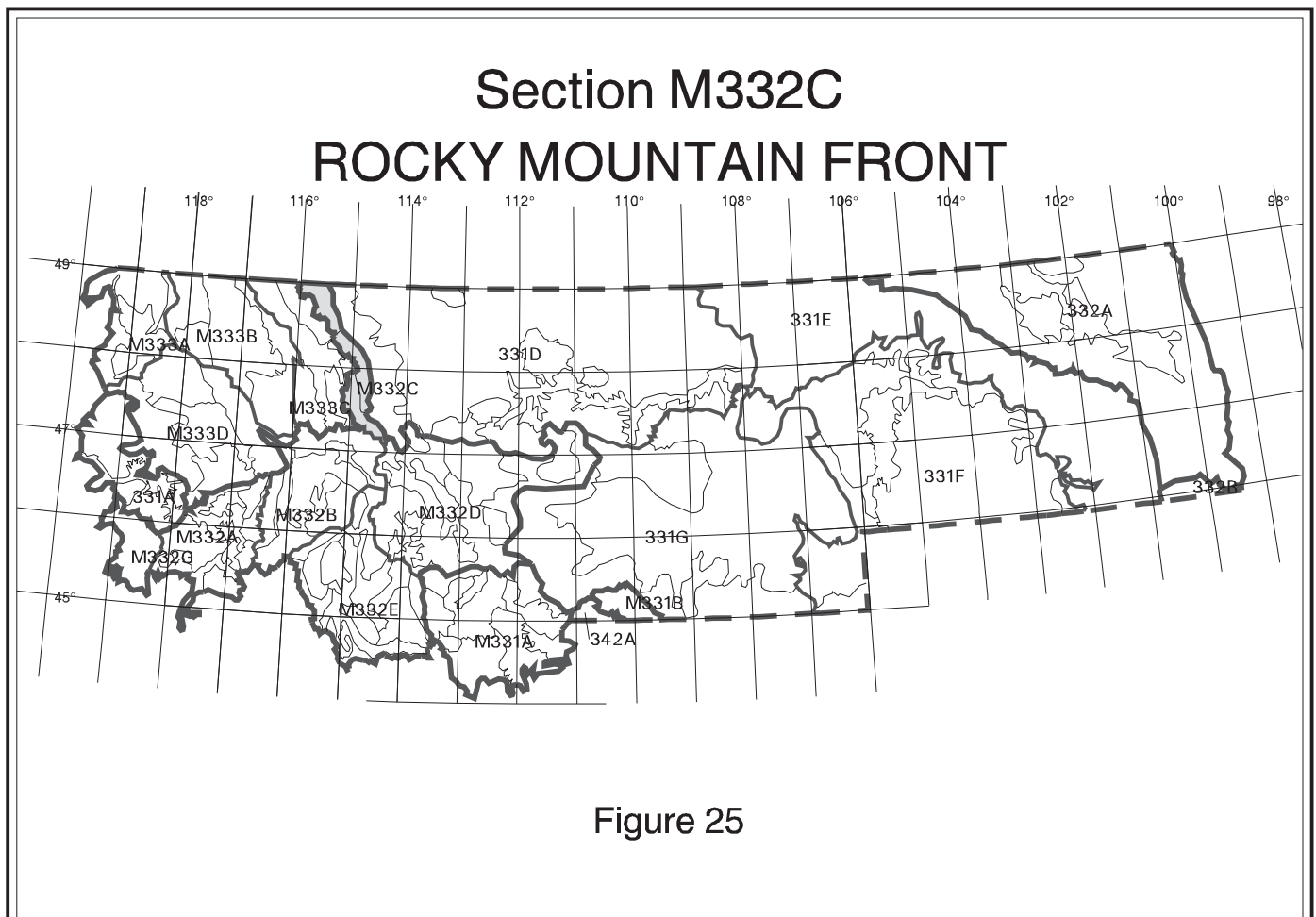
Landform Composition: Acres Mapped 99% of Total



Section M332B: BITTERROOT VALLEY

Parent Material Composition: Acres mapped 99% of Total





Section M332C



St. Marys Lake Glacier National Park

Section M332C ROCKY MOUNTAIN FRONT

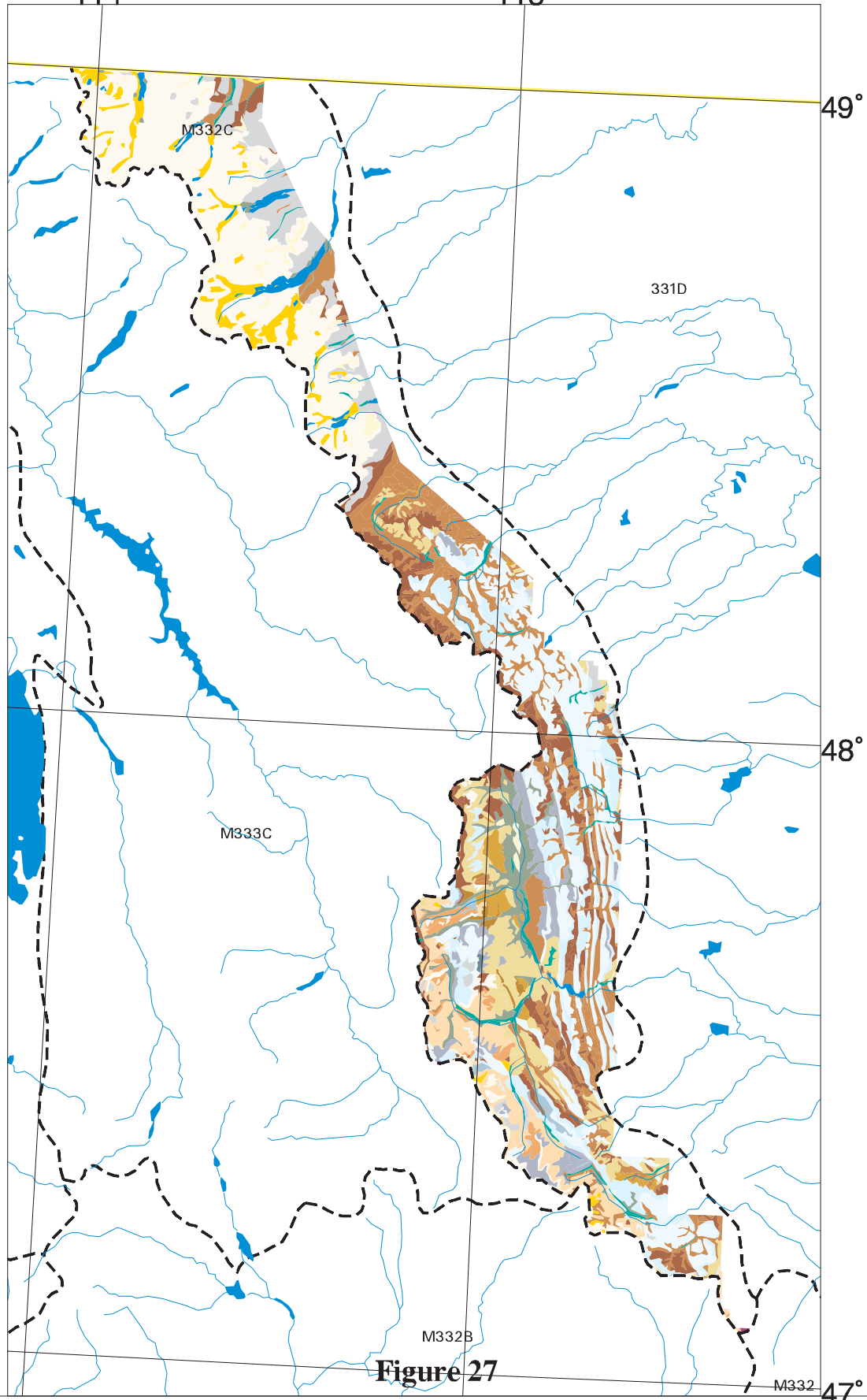
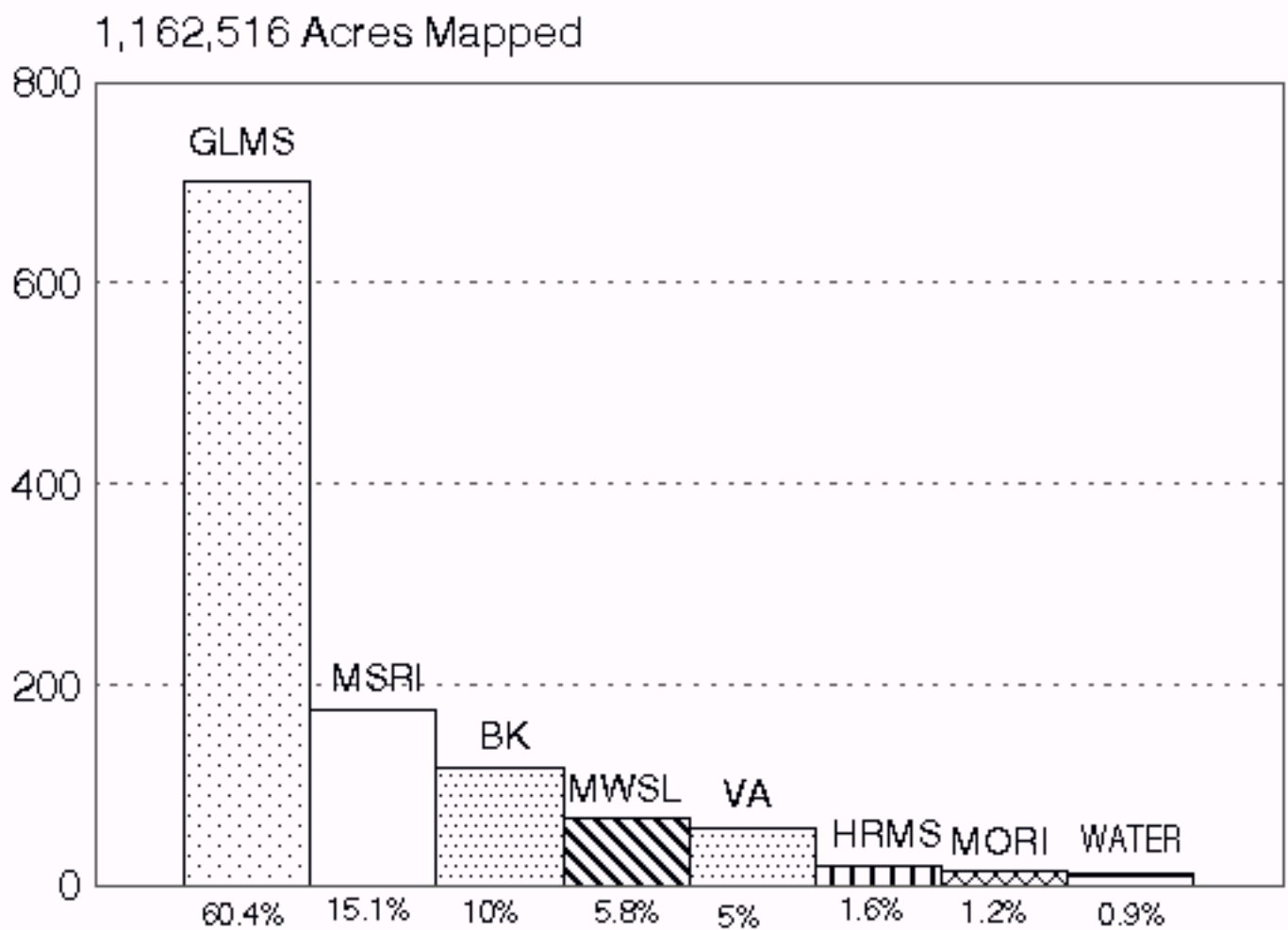


Figure 27

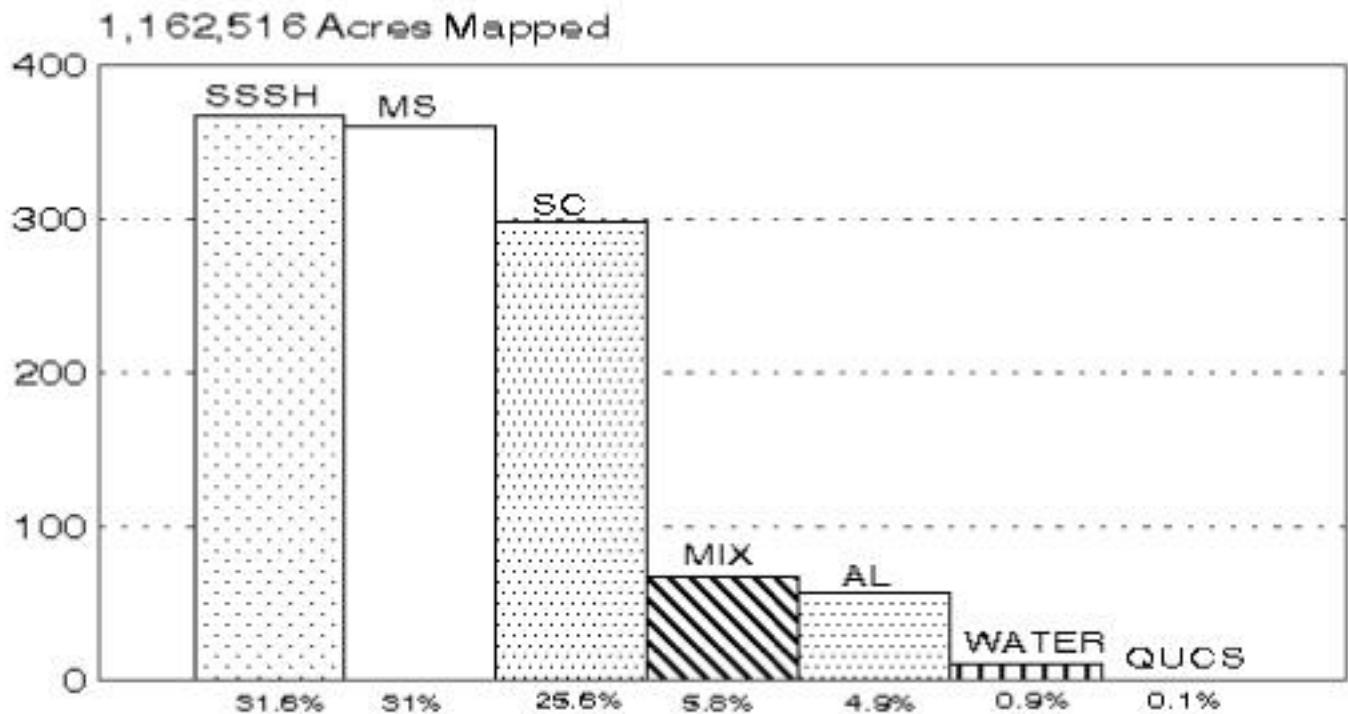
Section M332C: ROCKY MOUNTAIN FRONT

Landform Composition: Acres Mapped 81% of Total



Section M332C: ROCKY MOUNTAIN FRONT

Parent Material Composition: Acres mapped 81 % of Total





Subsections of Section M332D



Section M332D



Southwestern Elkhorn Mountains Helena N.F.

Section M332D BELT MOUNTAINS

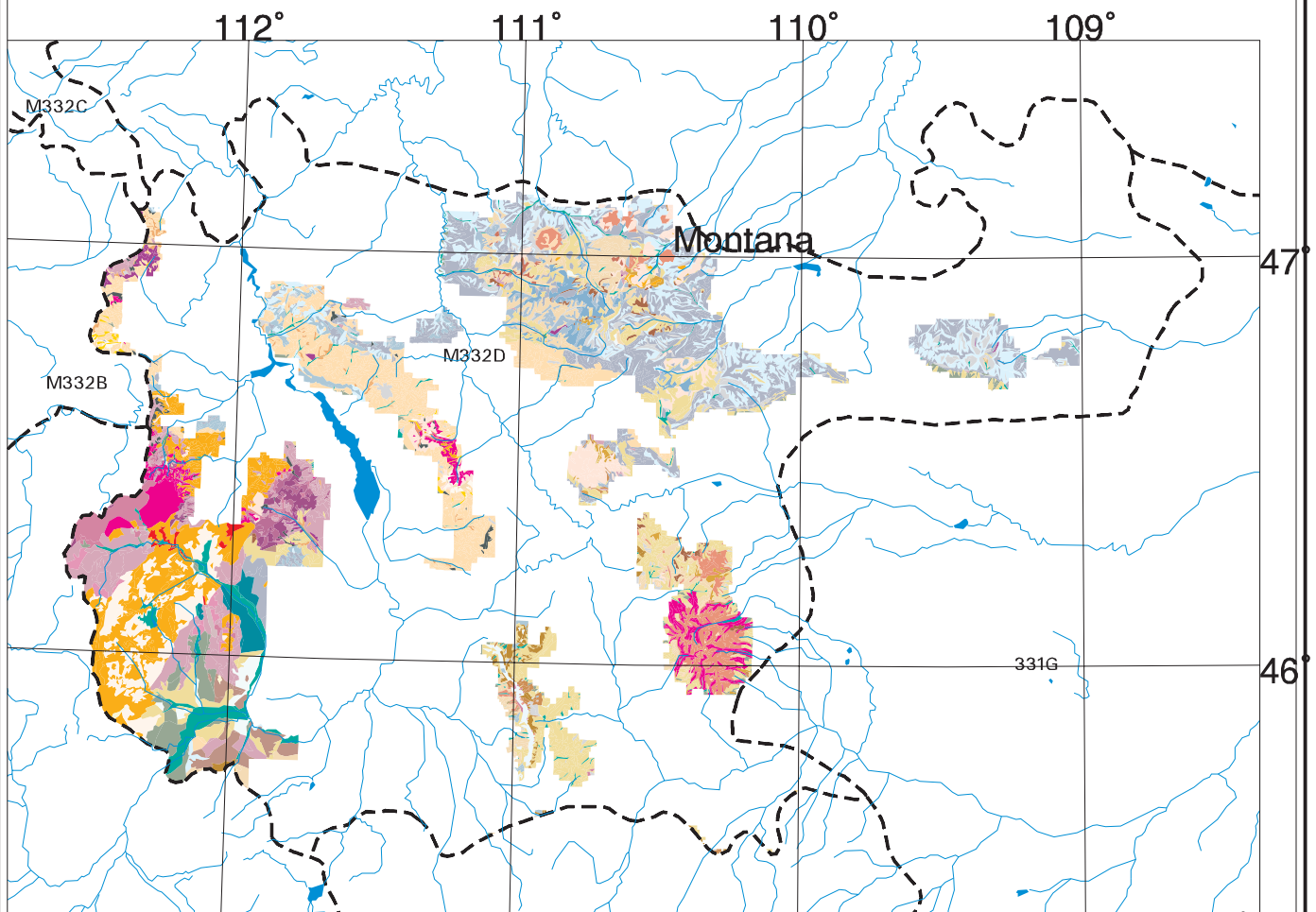
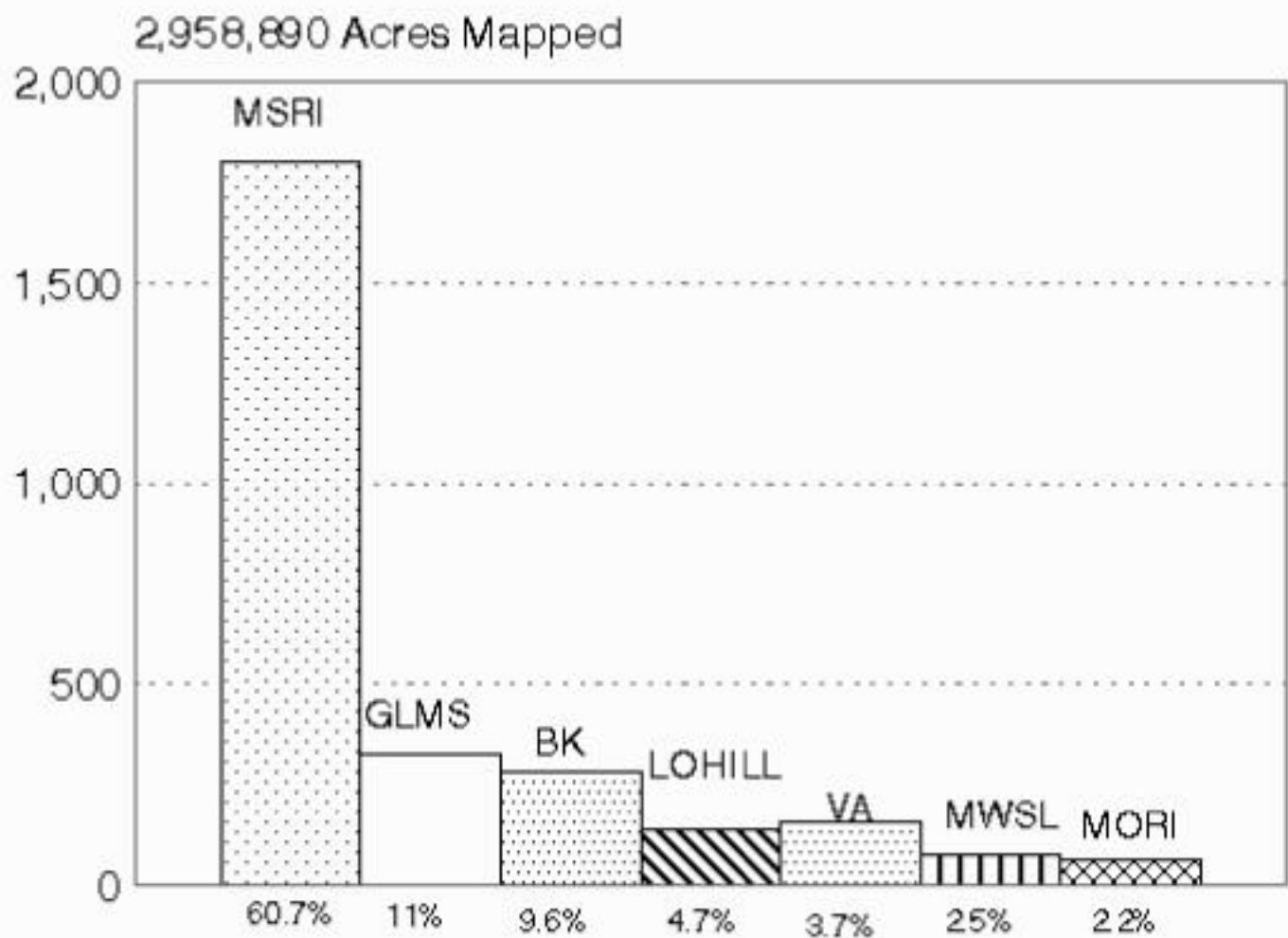


Figure 32

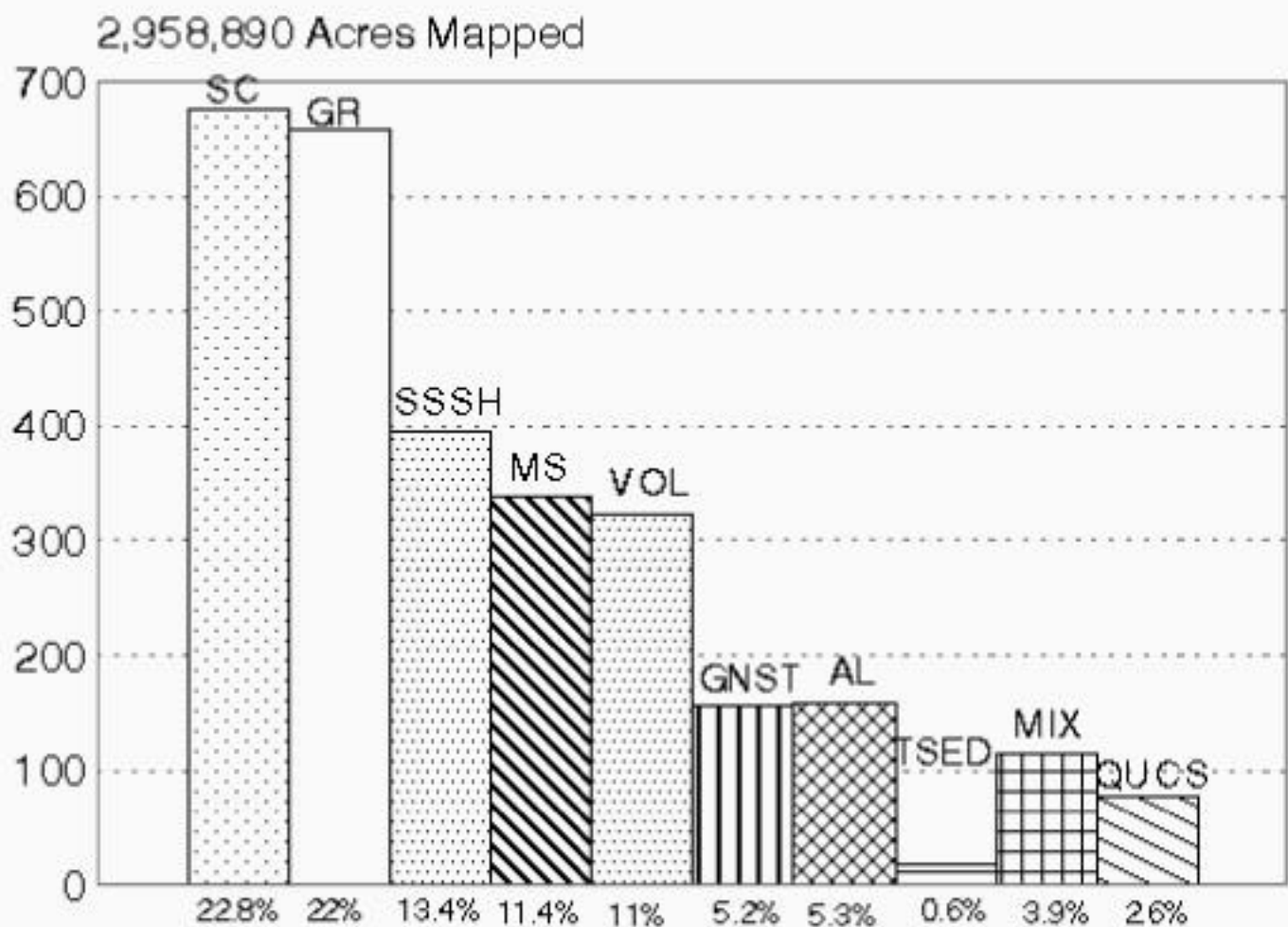
Section M332D: BELT MOUNTAINS

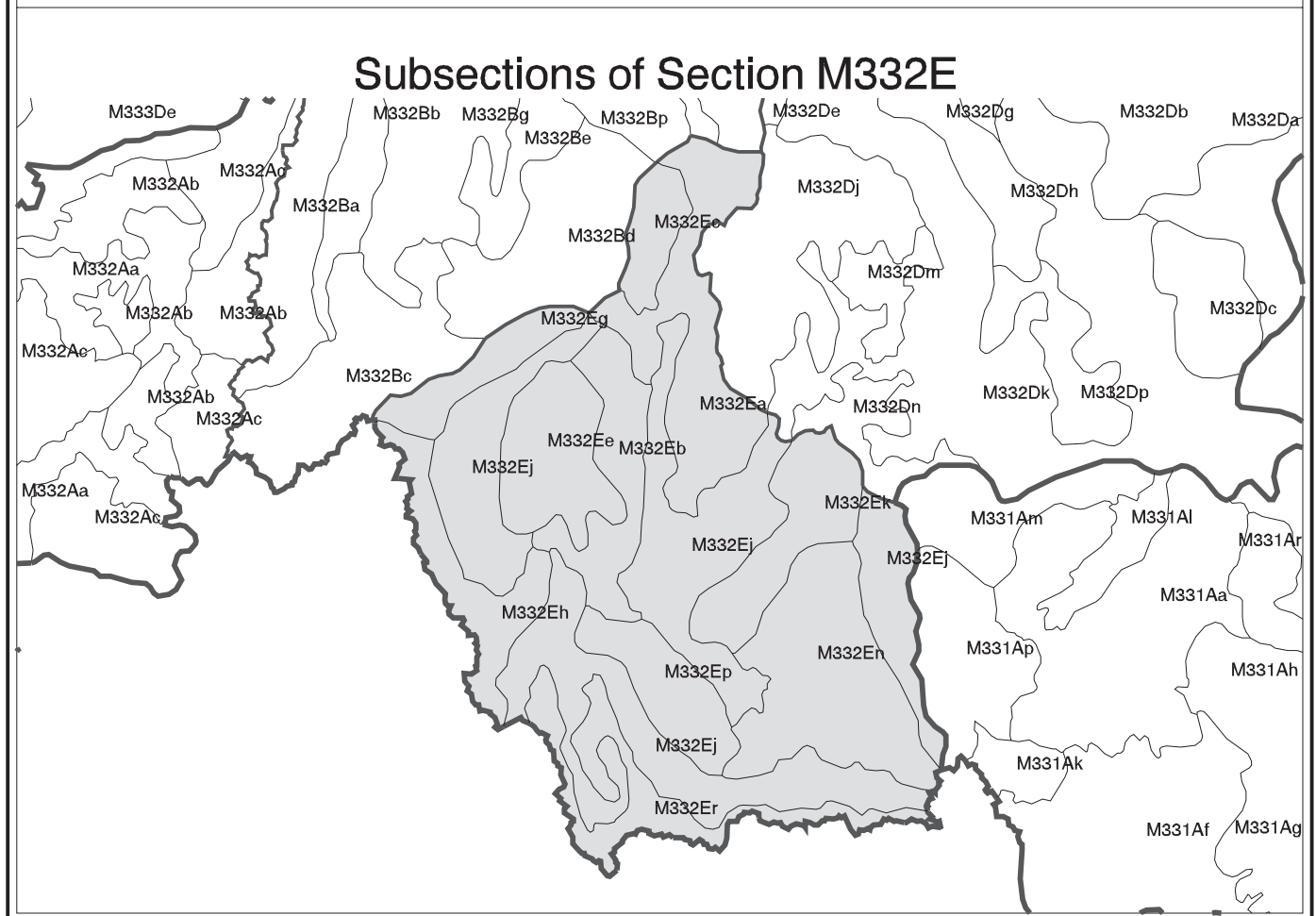
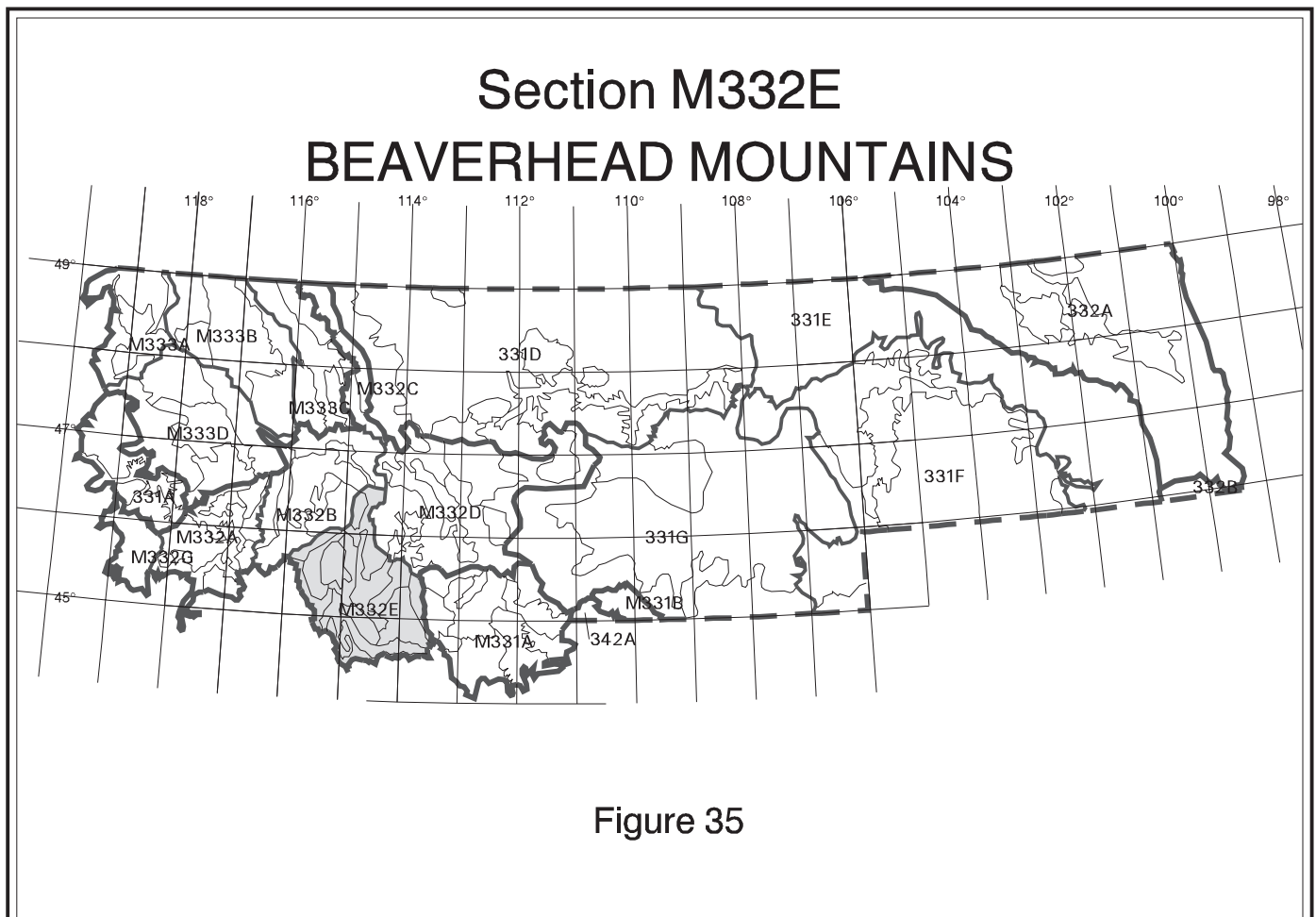
Landform Composition: Acres Mapped 32% of Total



Section M332D: BELT MOUNTAINS

Parent Material Composition: Acres Mapped 32% of Total





Section M332E



Southern Pioneer Range Deer Lodge-Beaverhead N.F.

Section M332E BEAVERHEAD MOUNTAINS

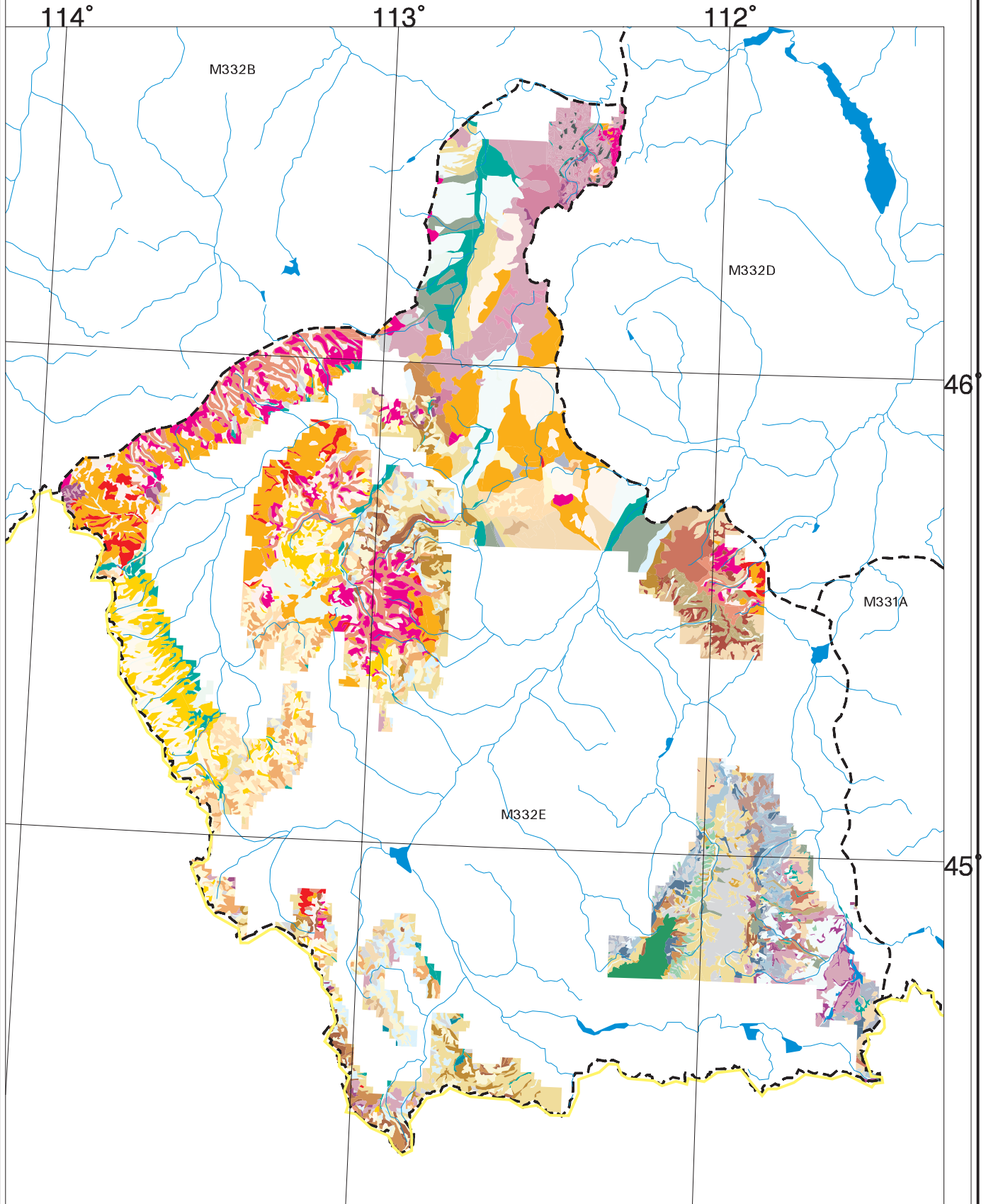
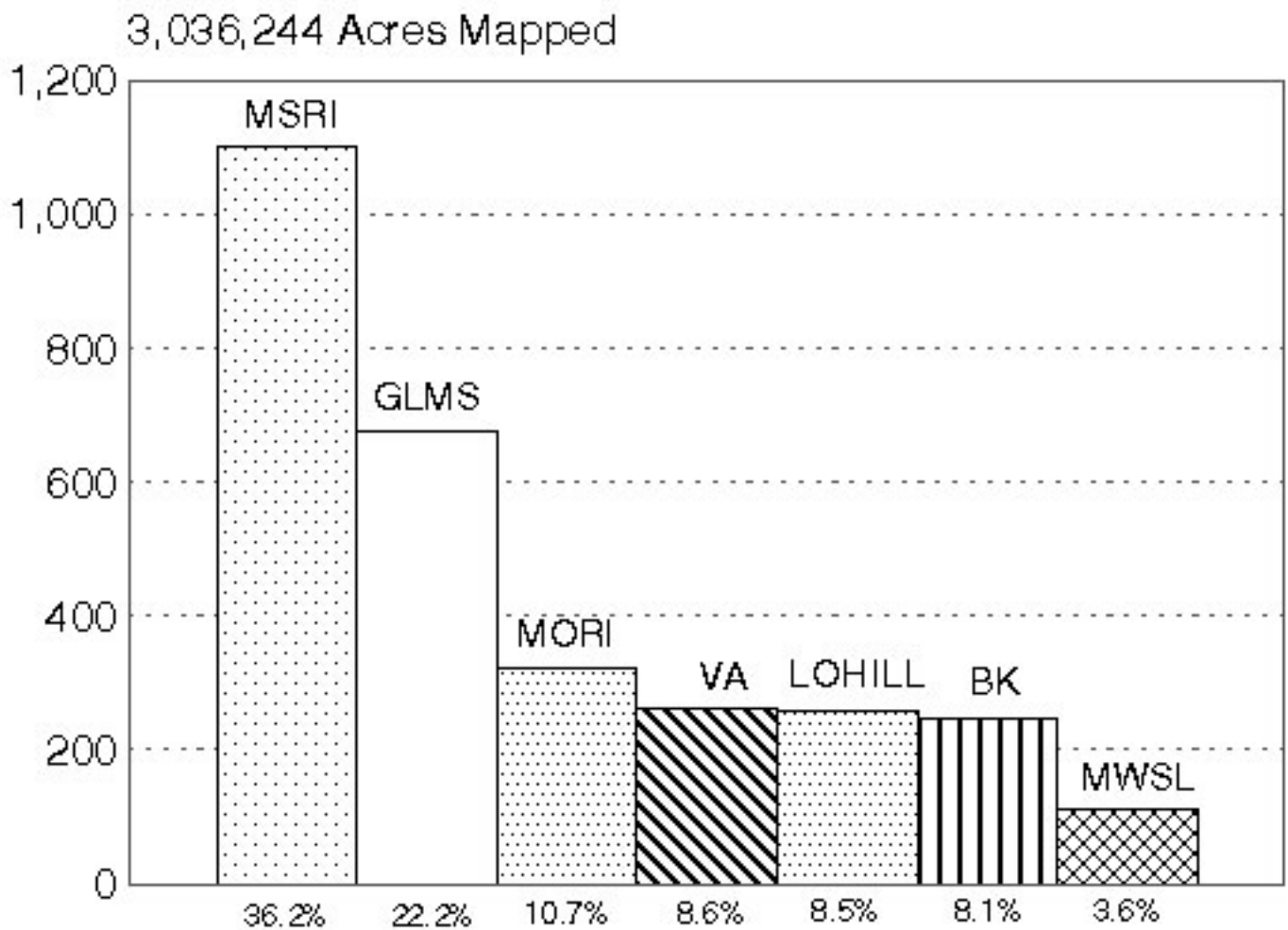


Figure 37

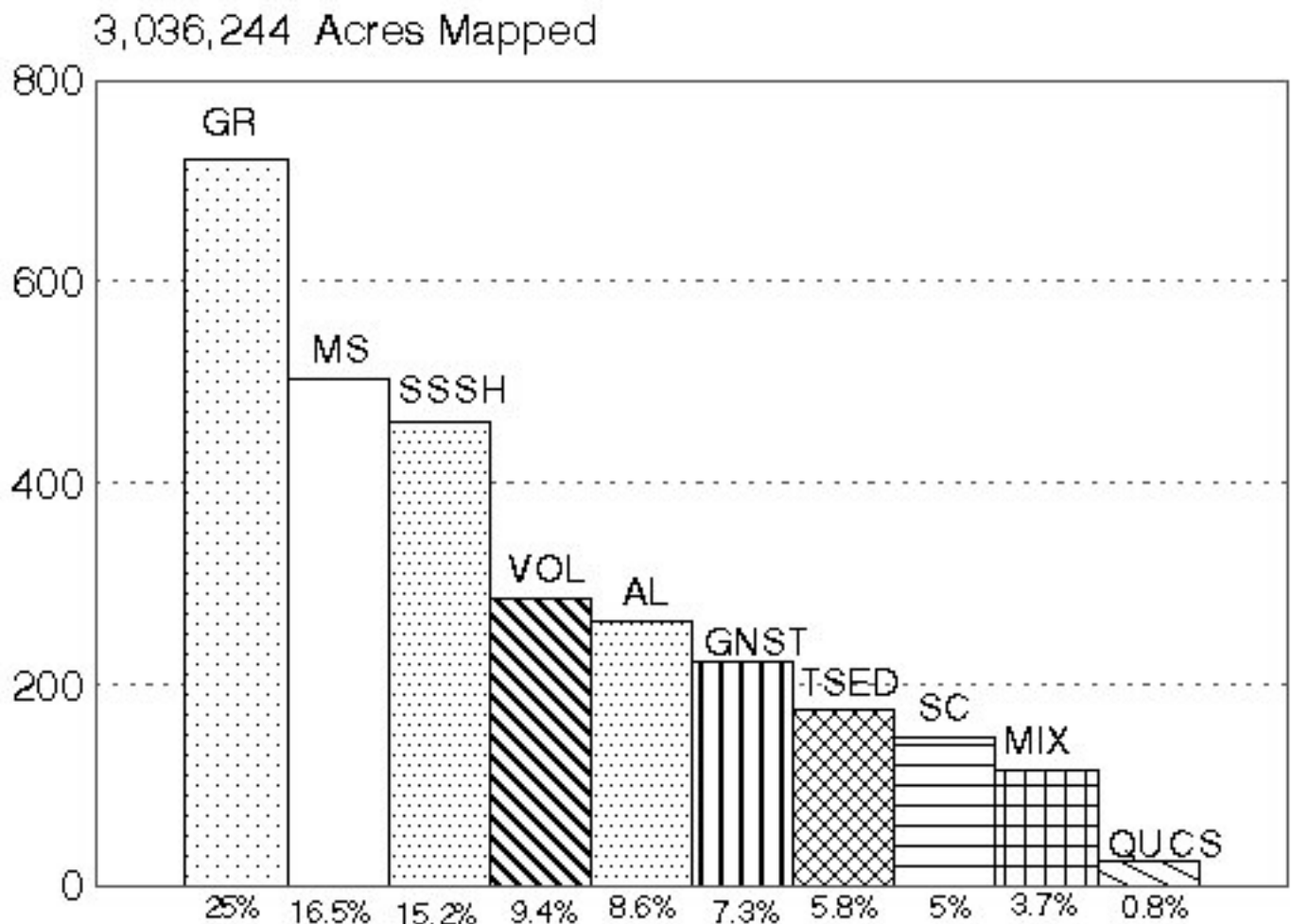
Section M332E: BEAVERHEAD MOUNTAINS

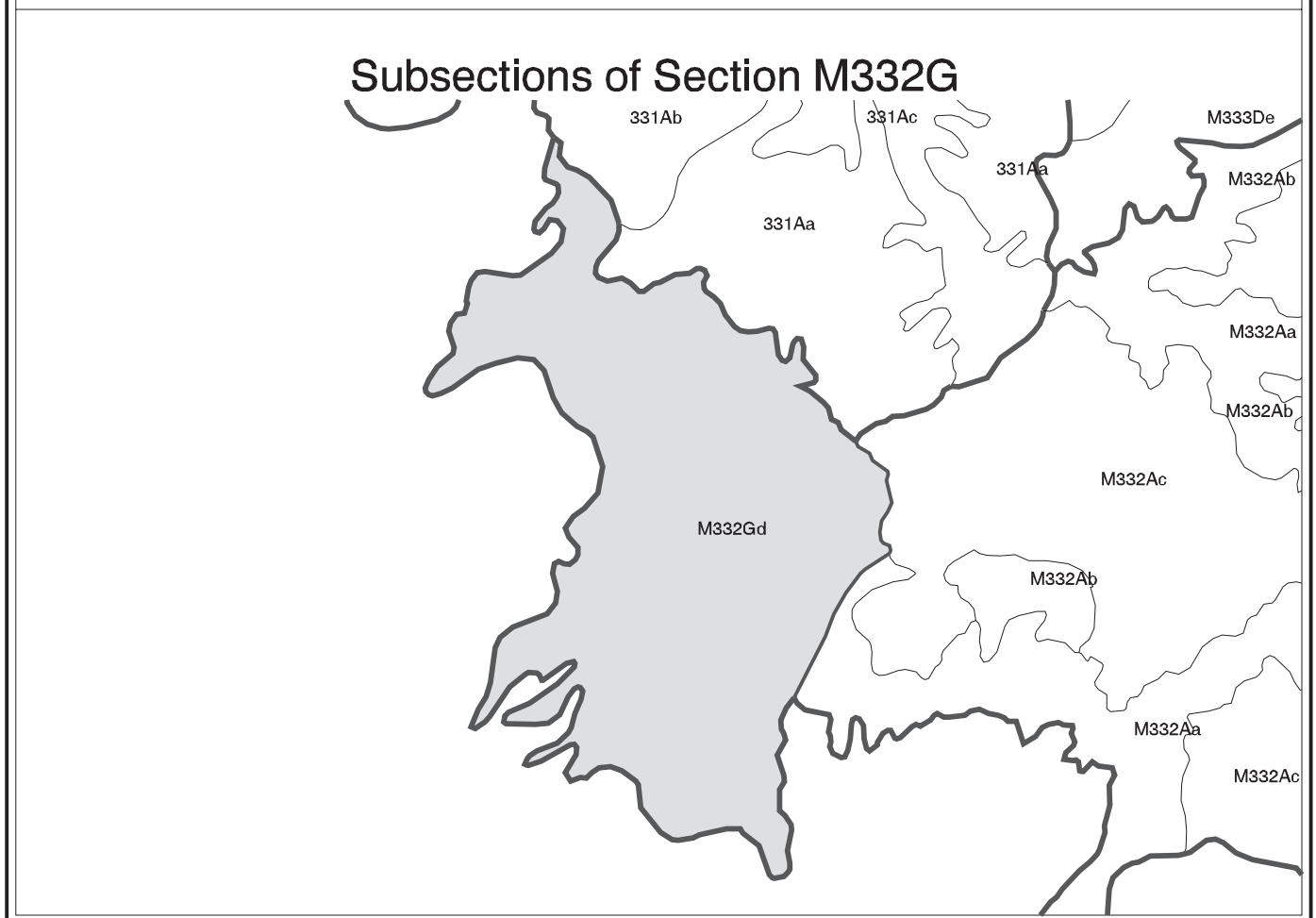
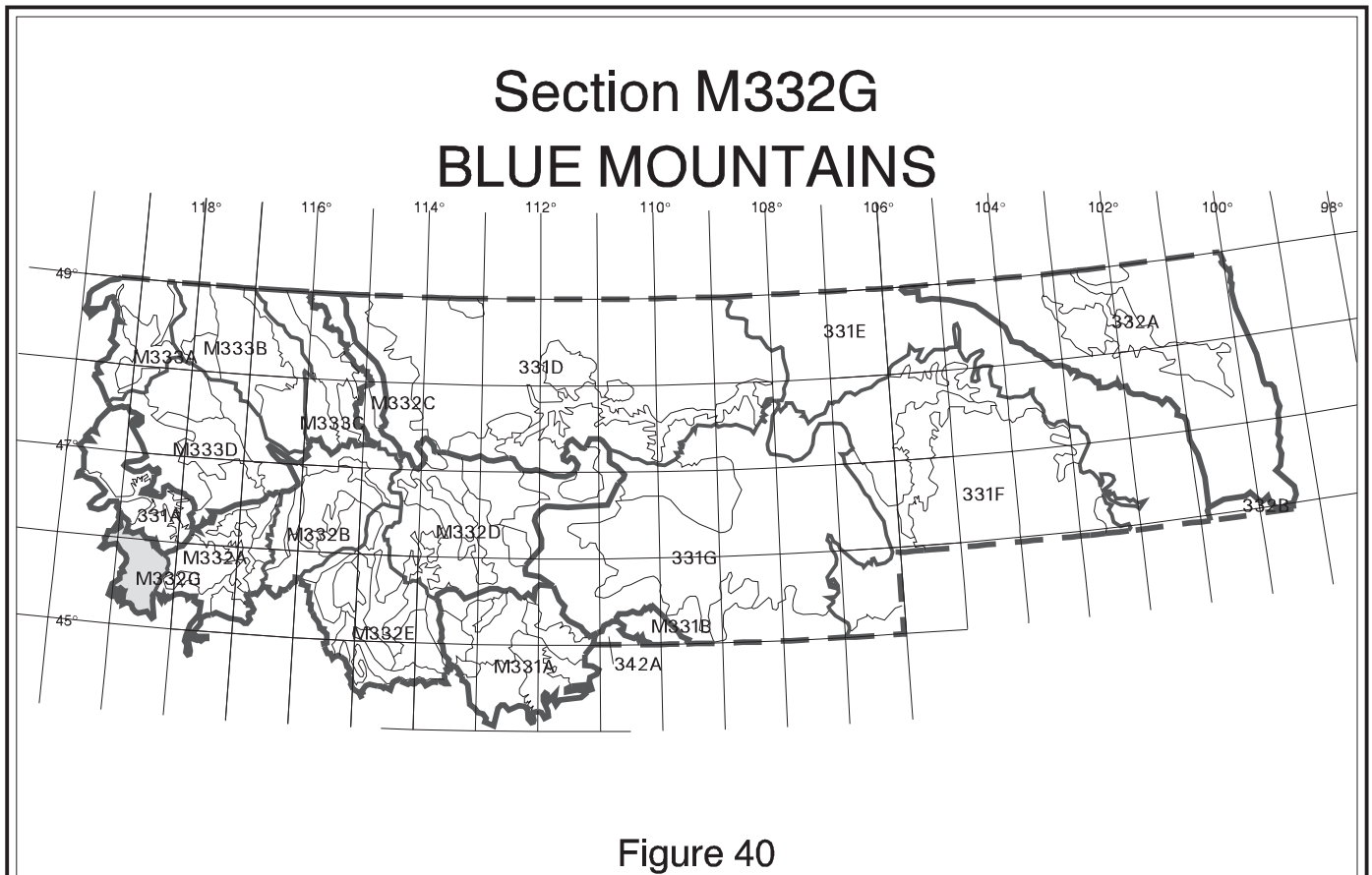
Landform Composition: Acres Mapped 48% of Total



Section M332E: BEAVERHEAD MOUNTAINS

Parent Material Composition: Acres Mapped 48% of Total





Section M332G



Near Pittsburgh Saddle Nez Perce N.F.

Section M332G BLUE MOUNTAINS

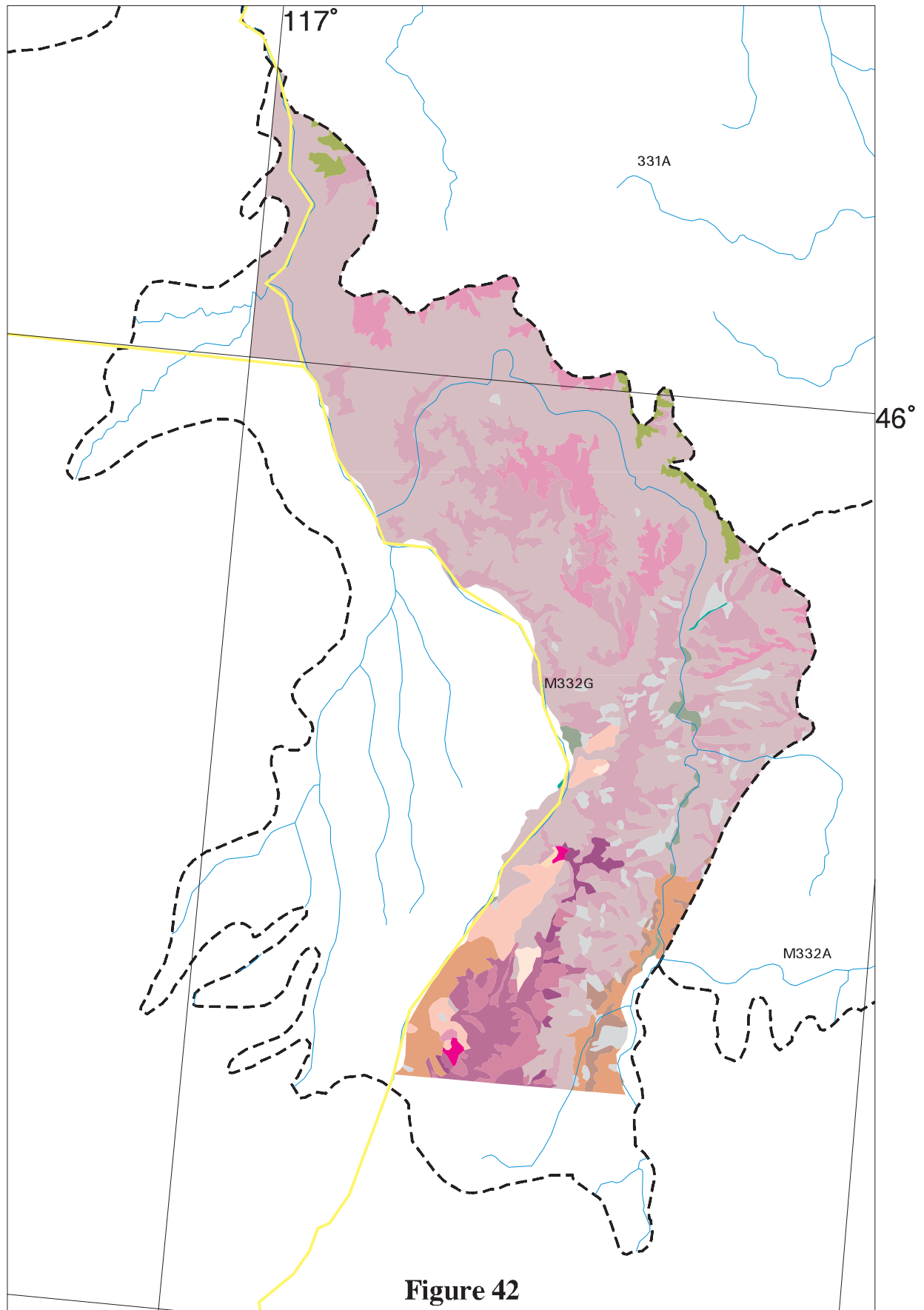
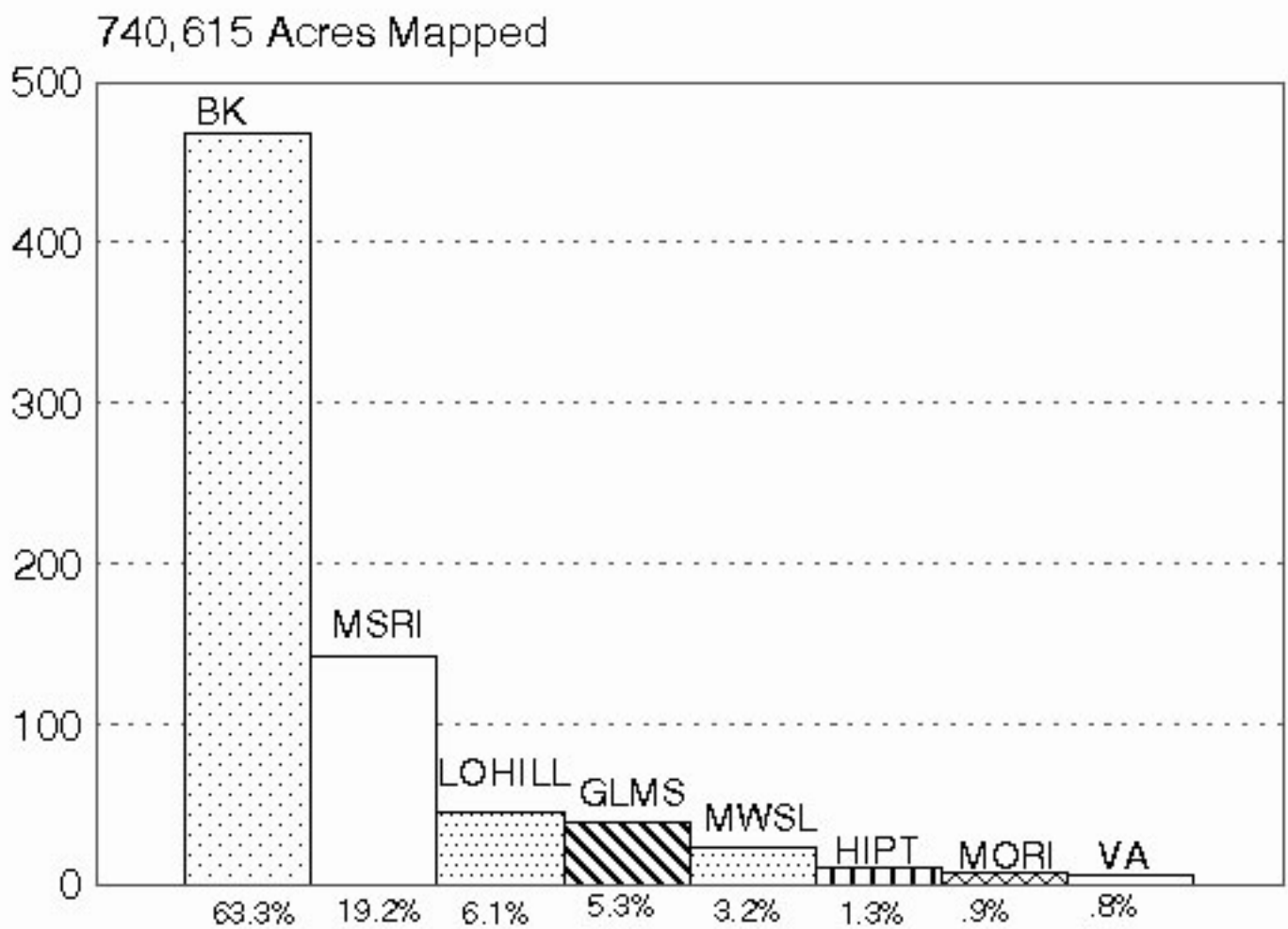


Figure 42

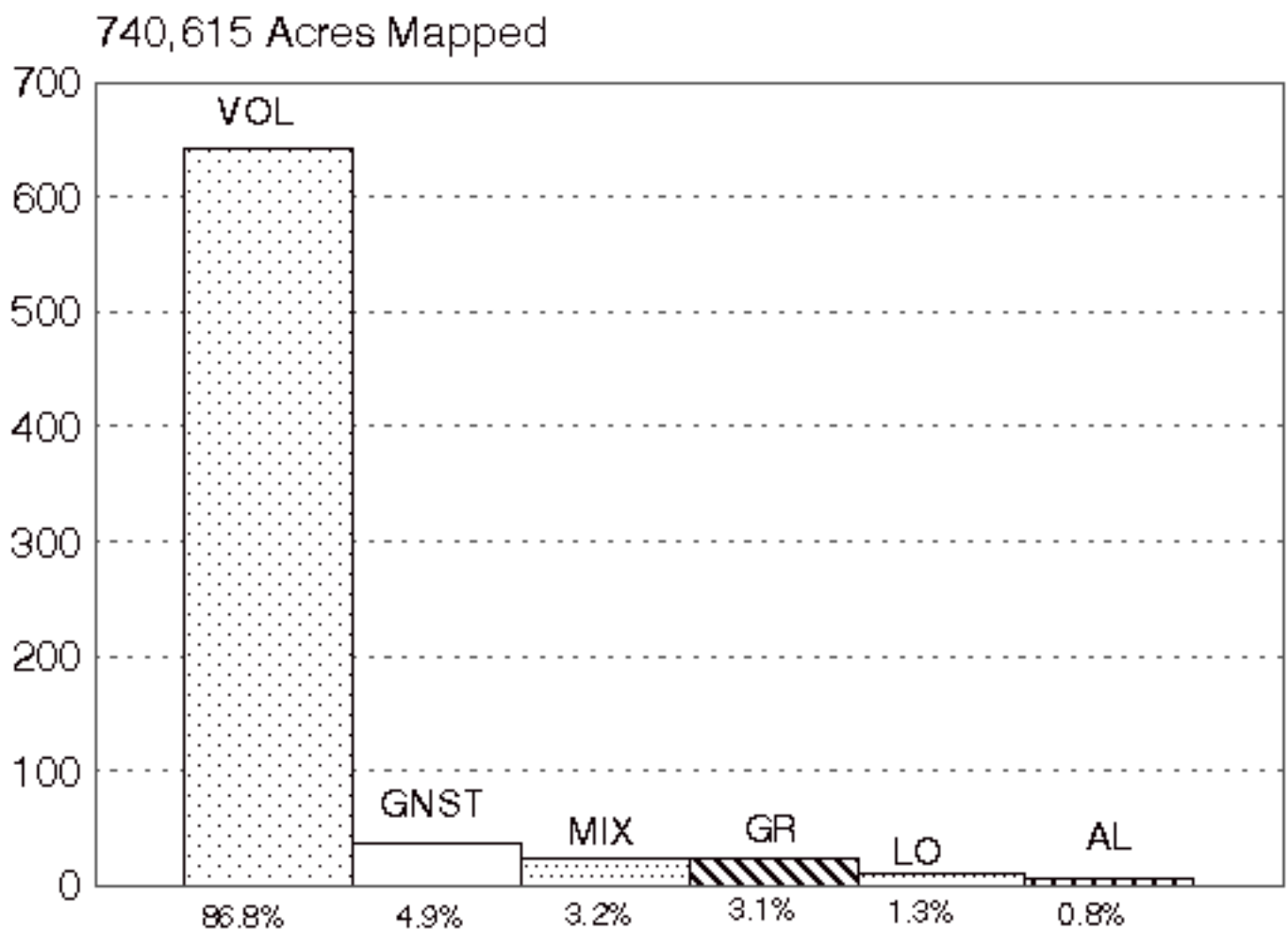
Section M332G: BLUE MOUNTAINS

Landform Composition: Acres Mapped 55% of Total



Section M332G: BLUE MOUNTAINS

Parent Material Composition: Acres Mapped 55% of Total



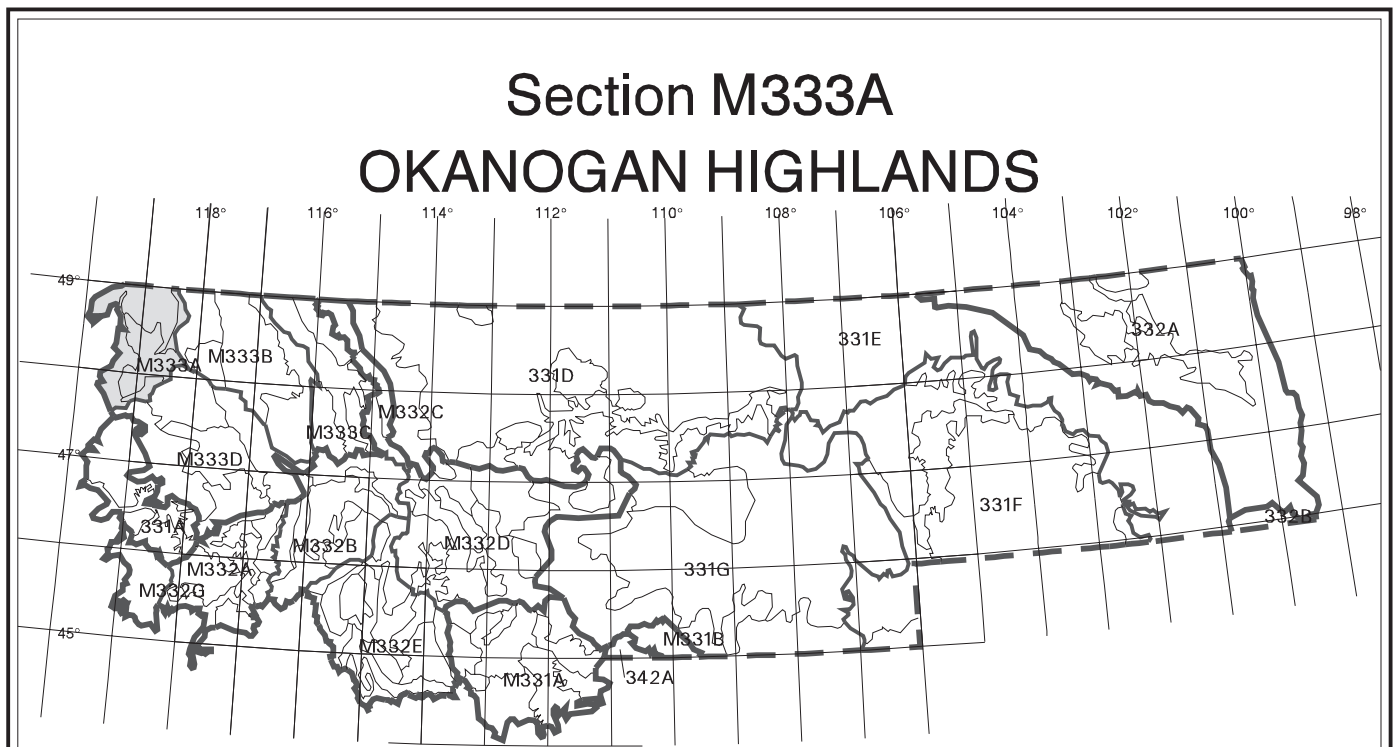
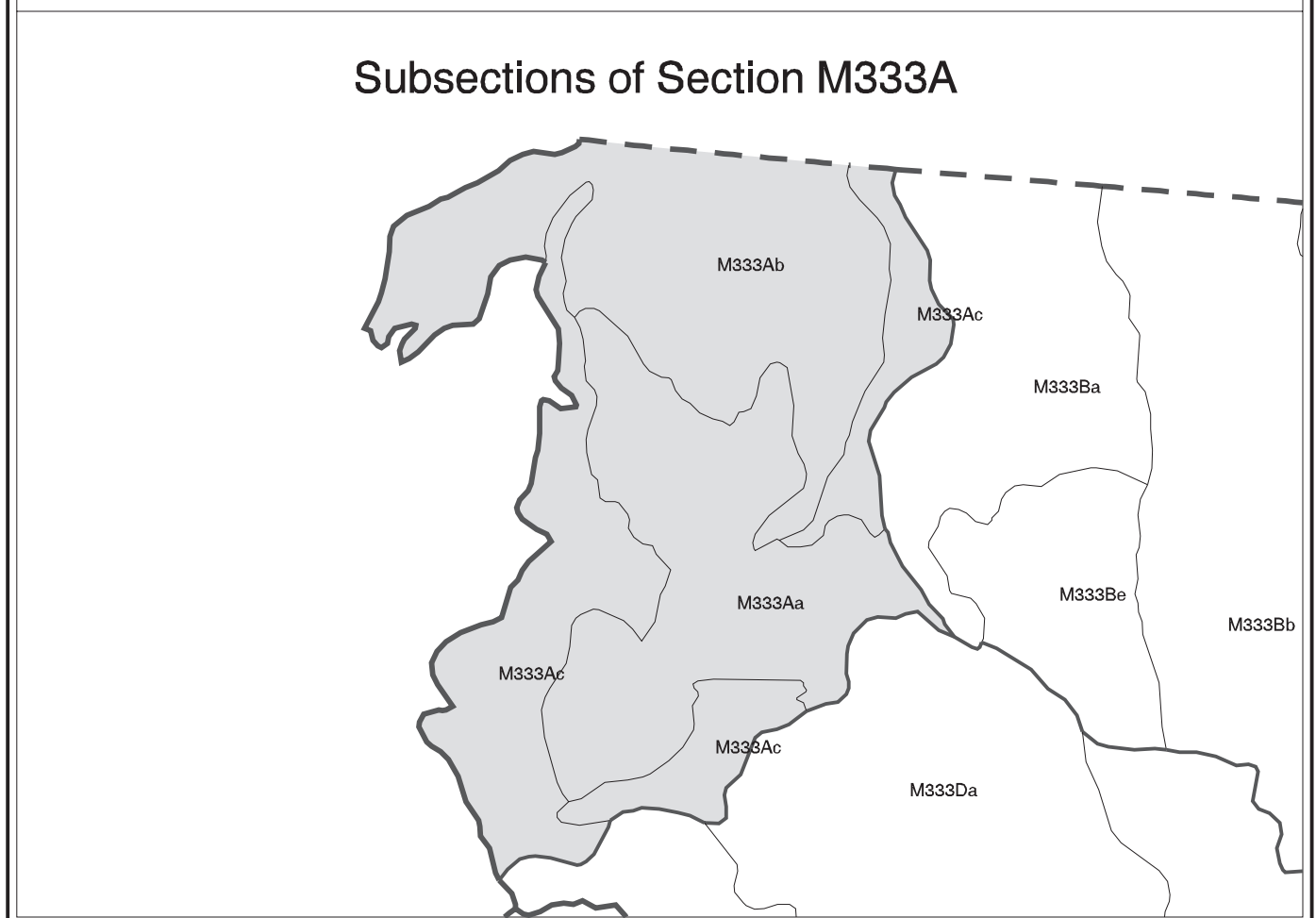


Figure 45



Section M333A



Selkirk Mountains Idaho Panhandle N.F.

Section M333A OKANOGAN HIGHLANDS

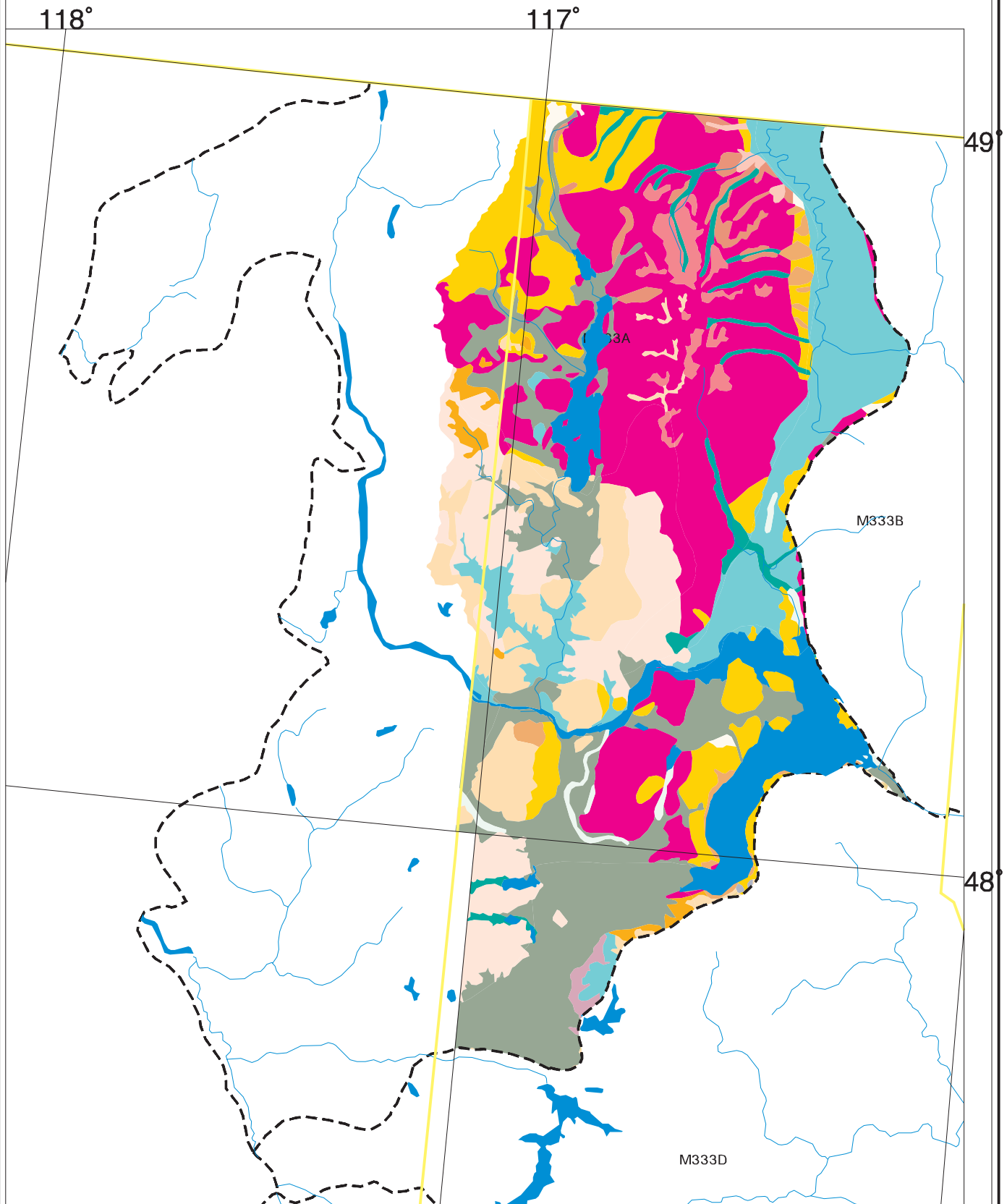
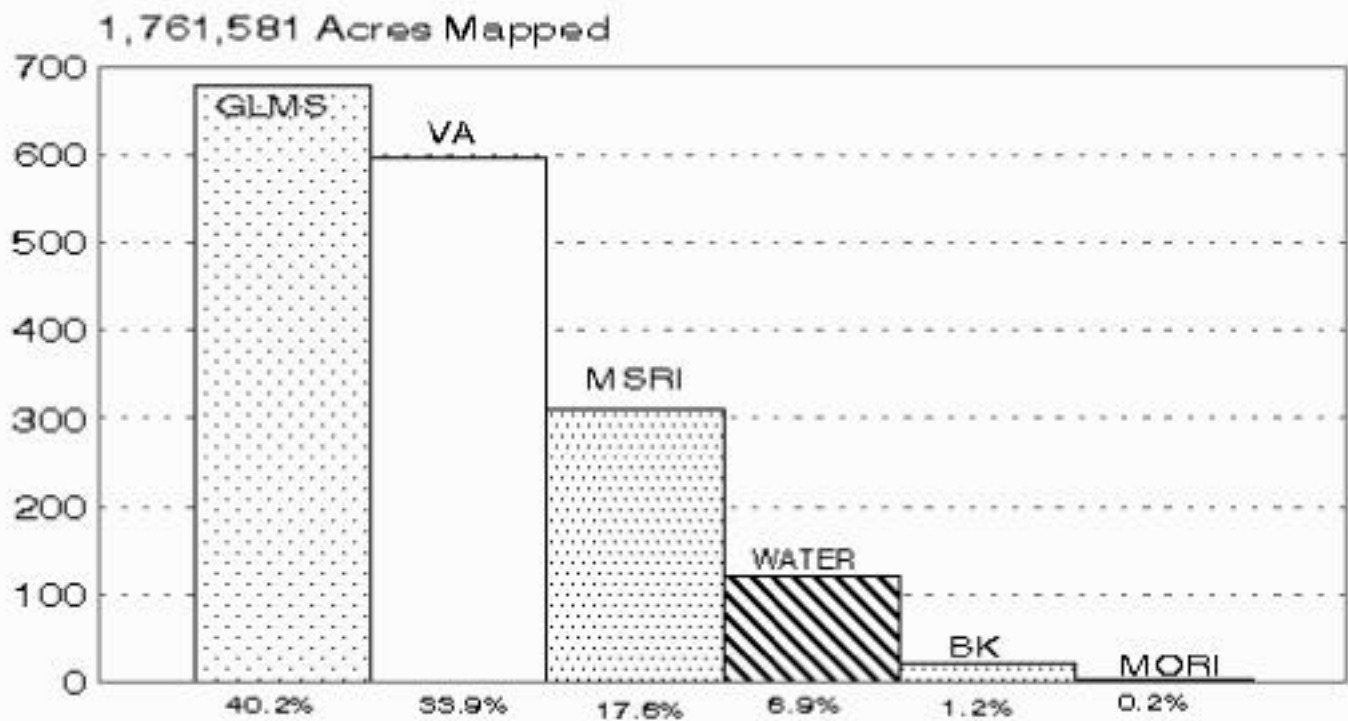


Figure 47

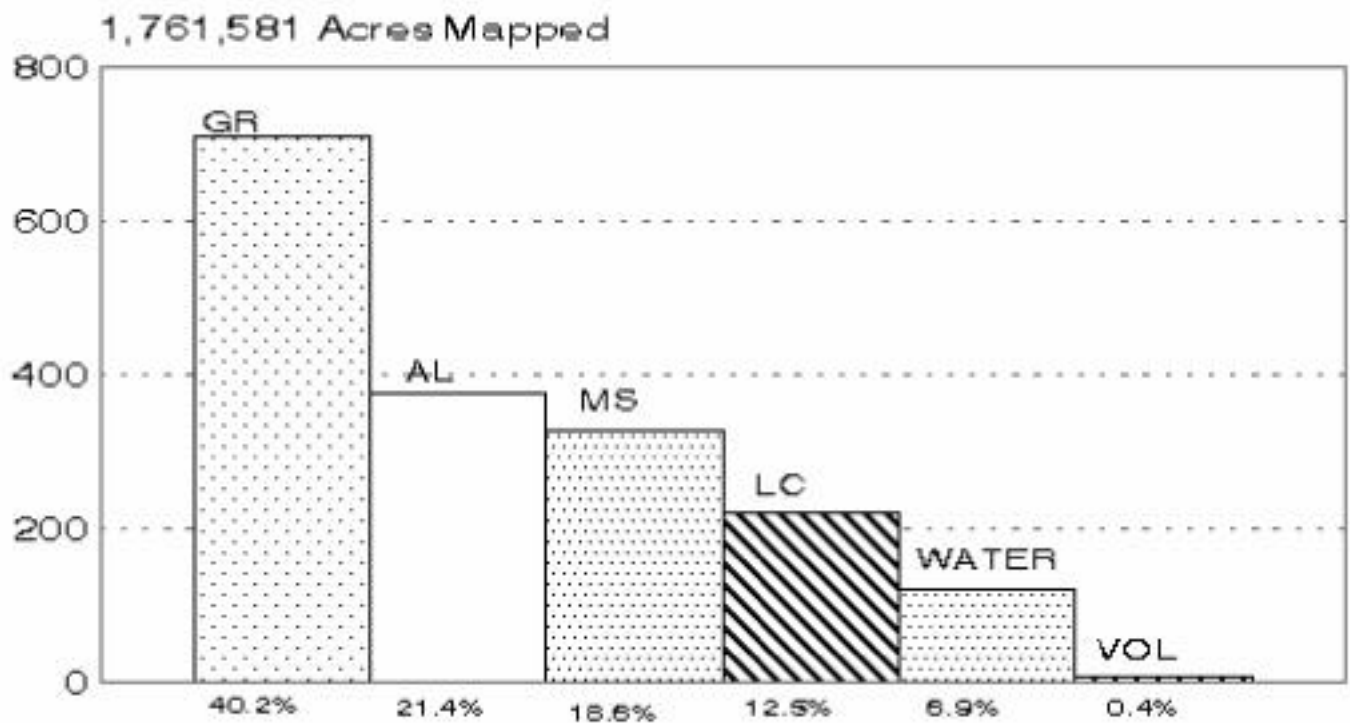
Section M333A: Okanagon Highlands

Landform Composition: Acres Mapped 57% of Total



Section M333A: Okanagon Highlands

Parent Material Composition: Acres Mapped 57% of Total





Subsections of Section M333B



Section M333B



Salish Mountains and Ashley Lake Flathead N.F.

Section M333B FLATHEAD VALLEY

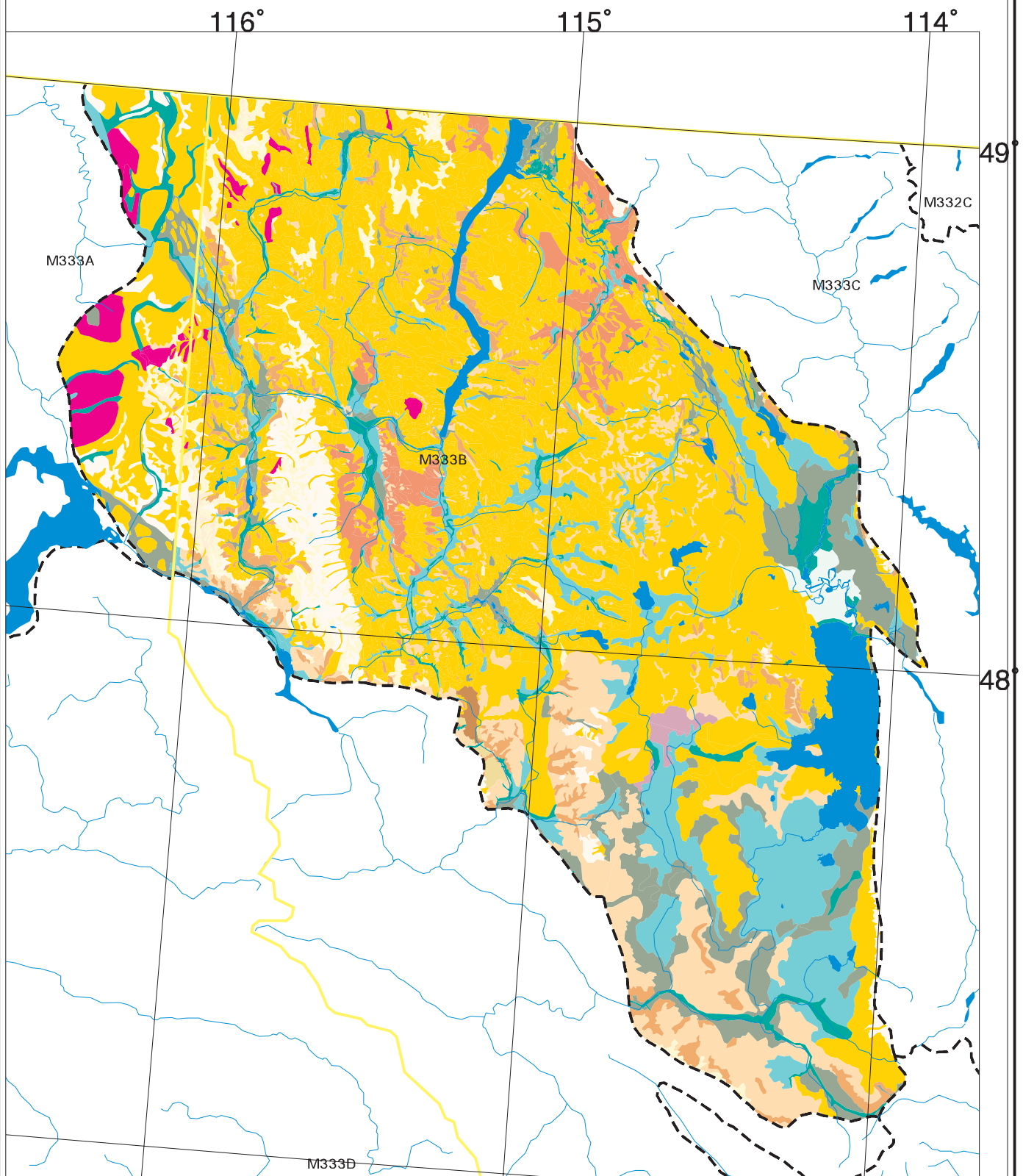
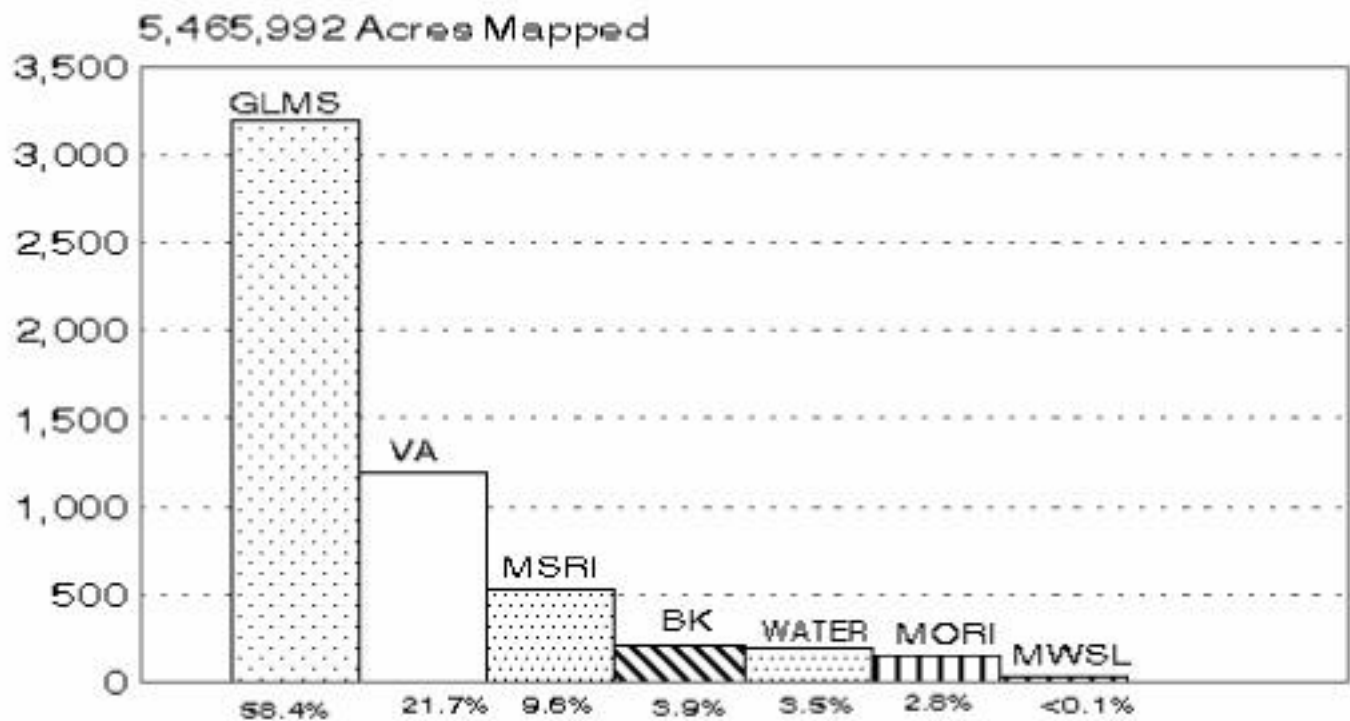


Figure 52

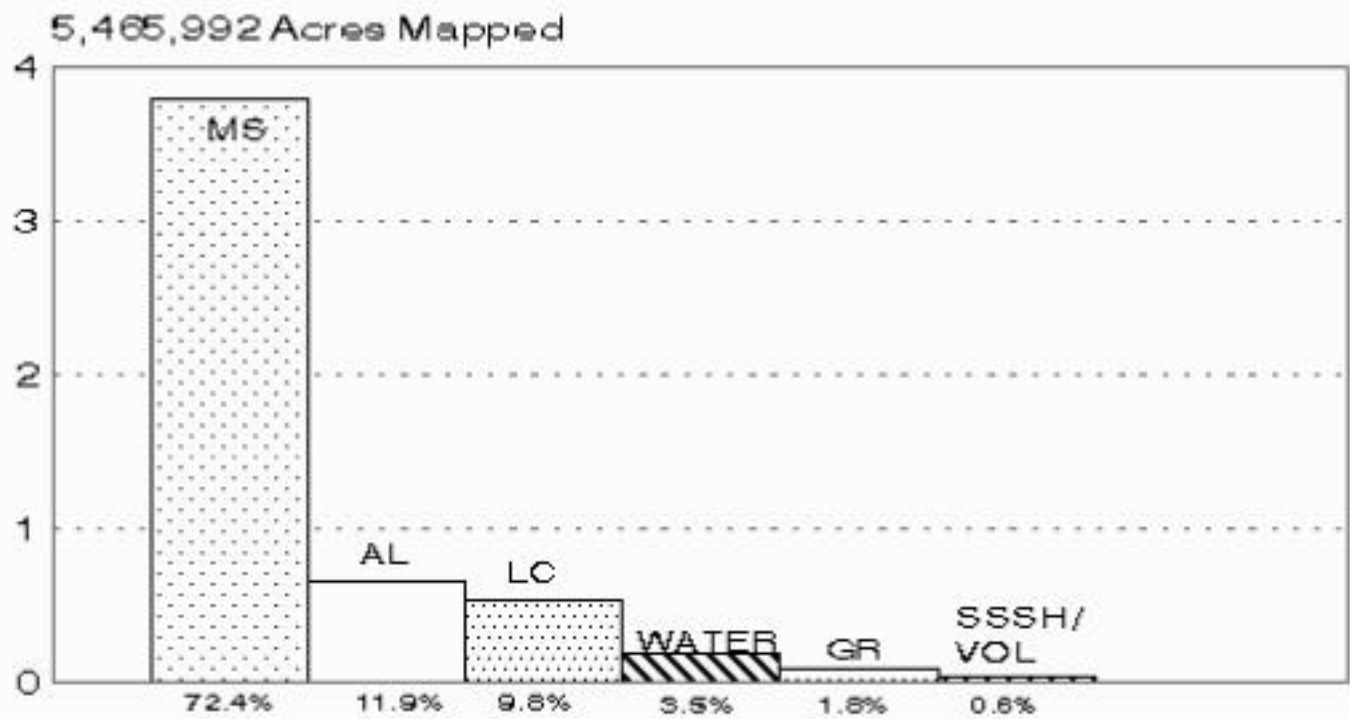
Section M333B: FLATHEAD VALLEY

Landform Composition: Acres Mapped 100% of Total



Section M333B: FLATHEAD VALLEY

Parent Material Composition: Acres Mapped 100% of Total



Section M333C NORTHERN ROCKIES

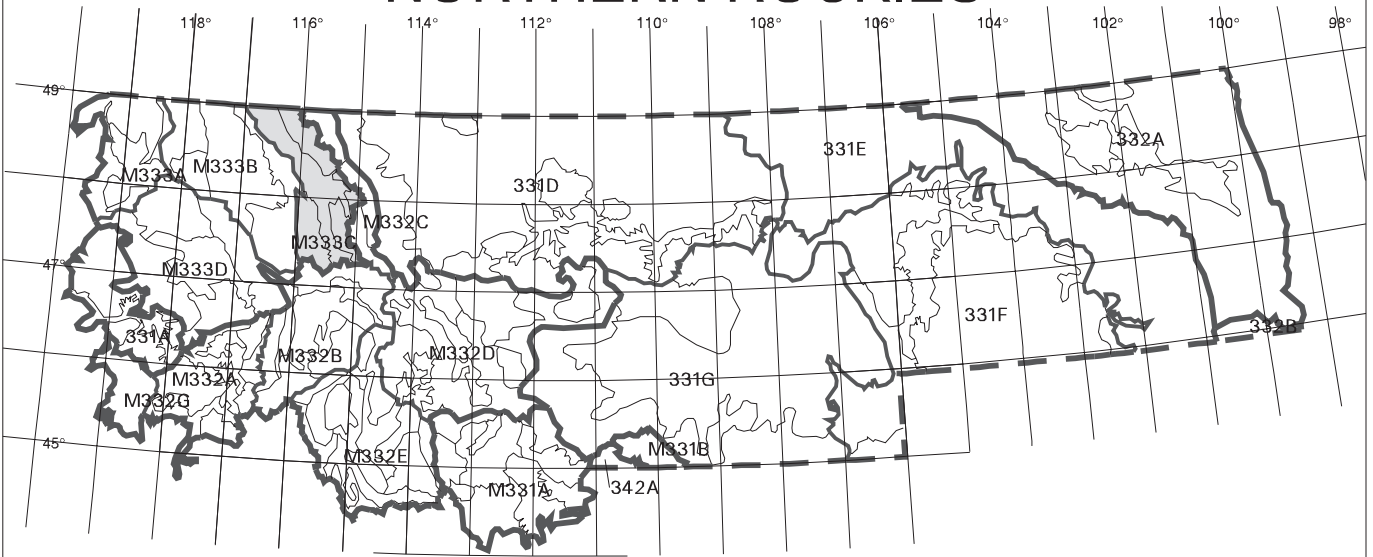
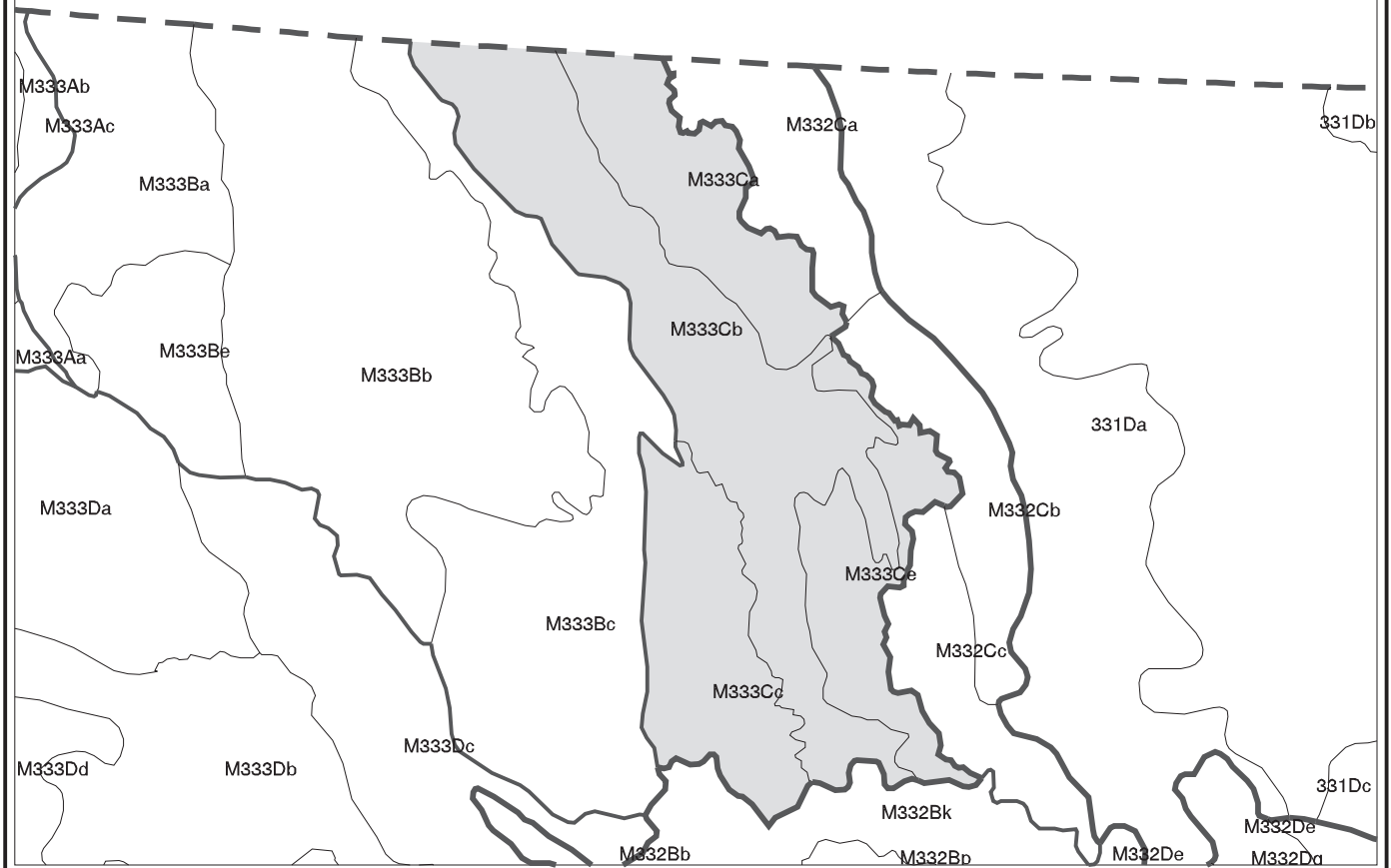


Figure 55

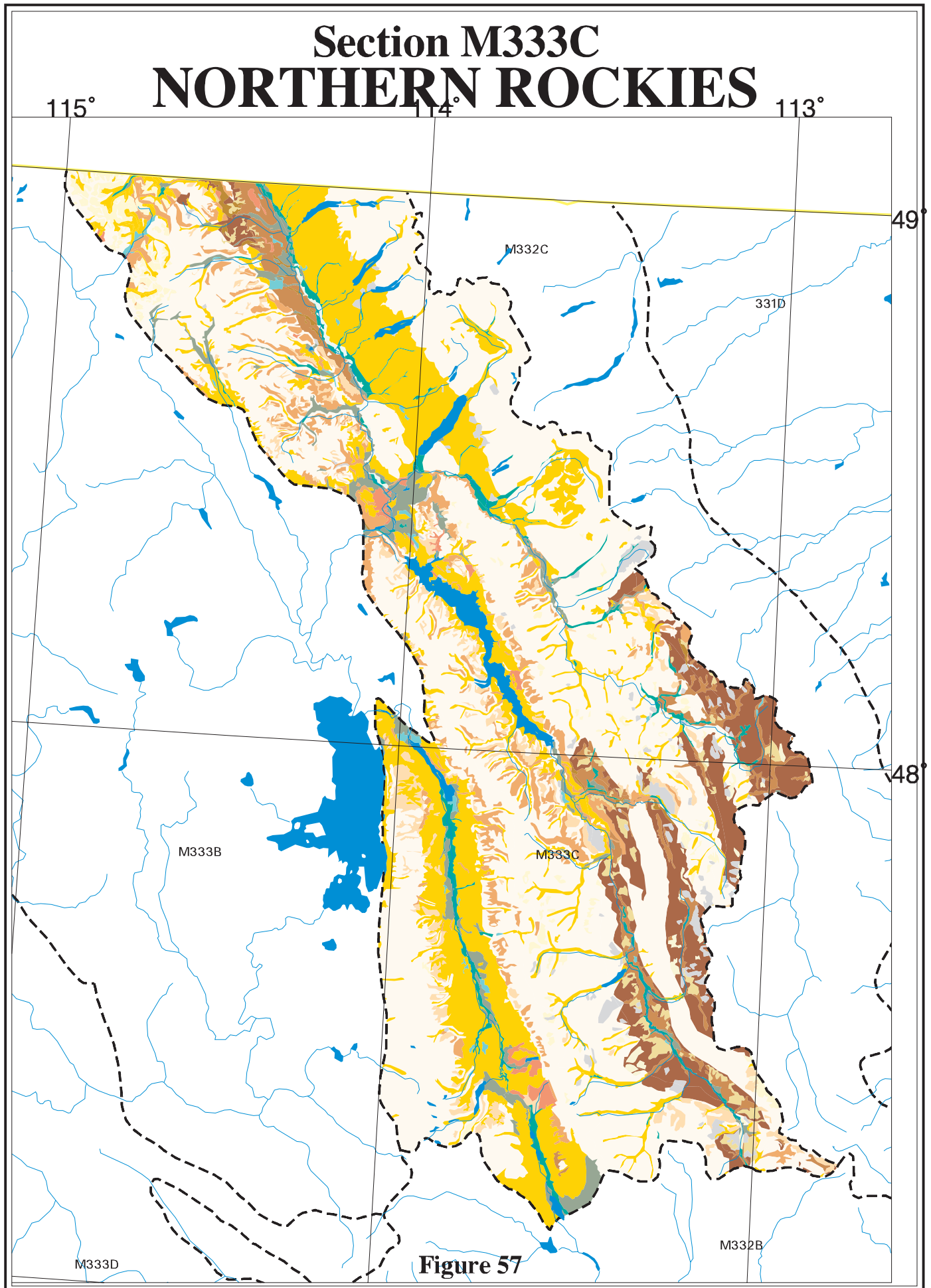
Subsections of Section M333C



Section M333C

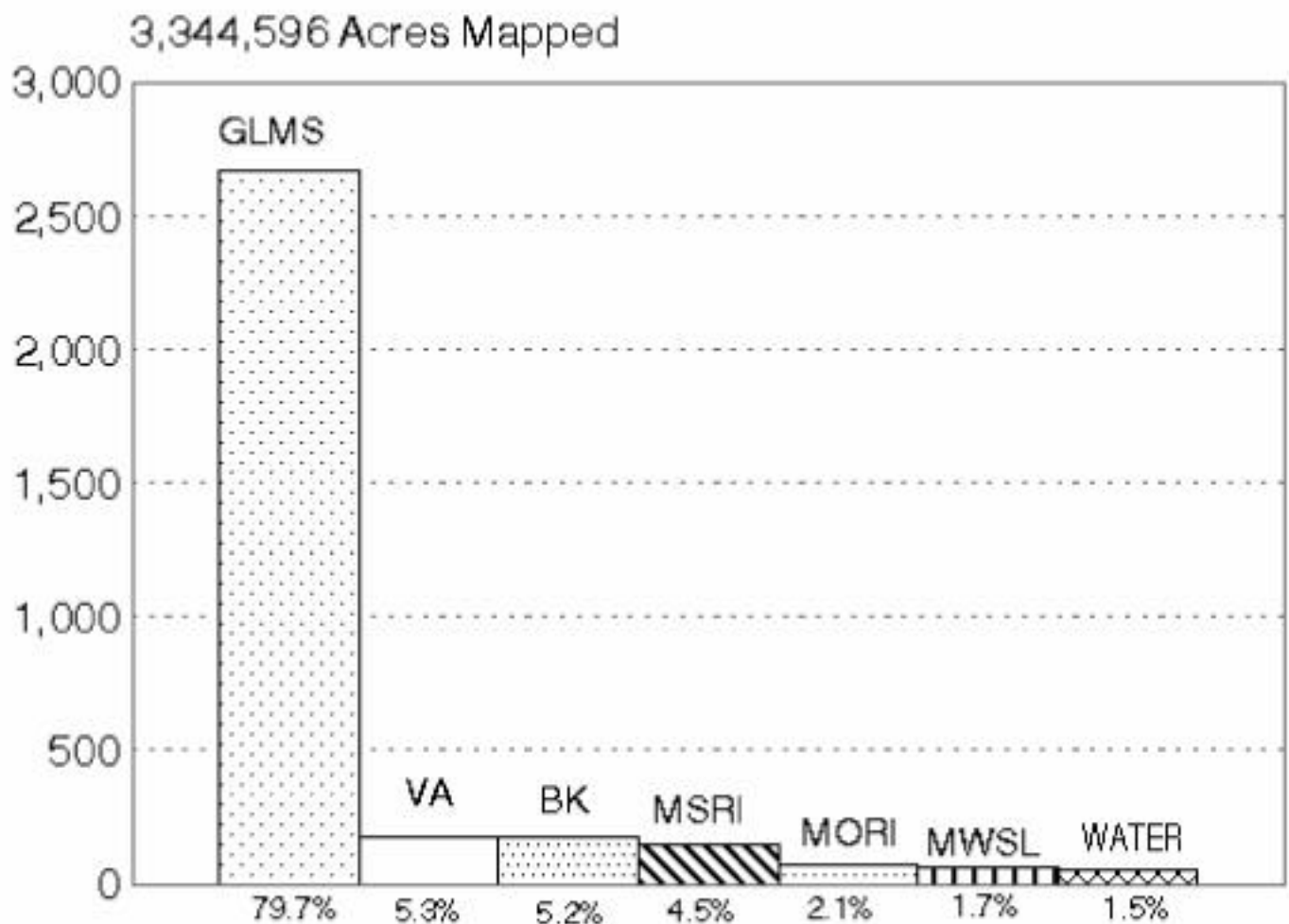


Mission Valley and Mission Range Flathead N.F.



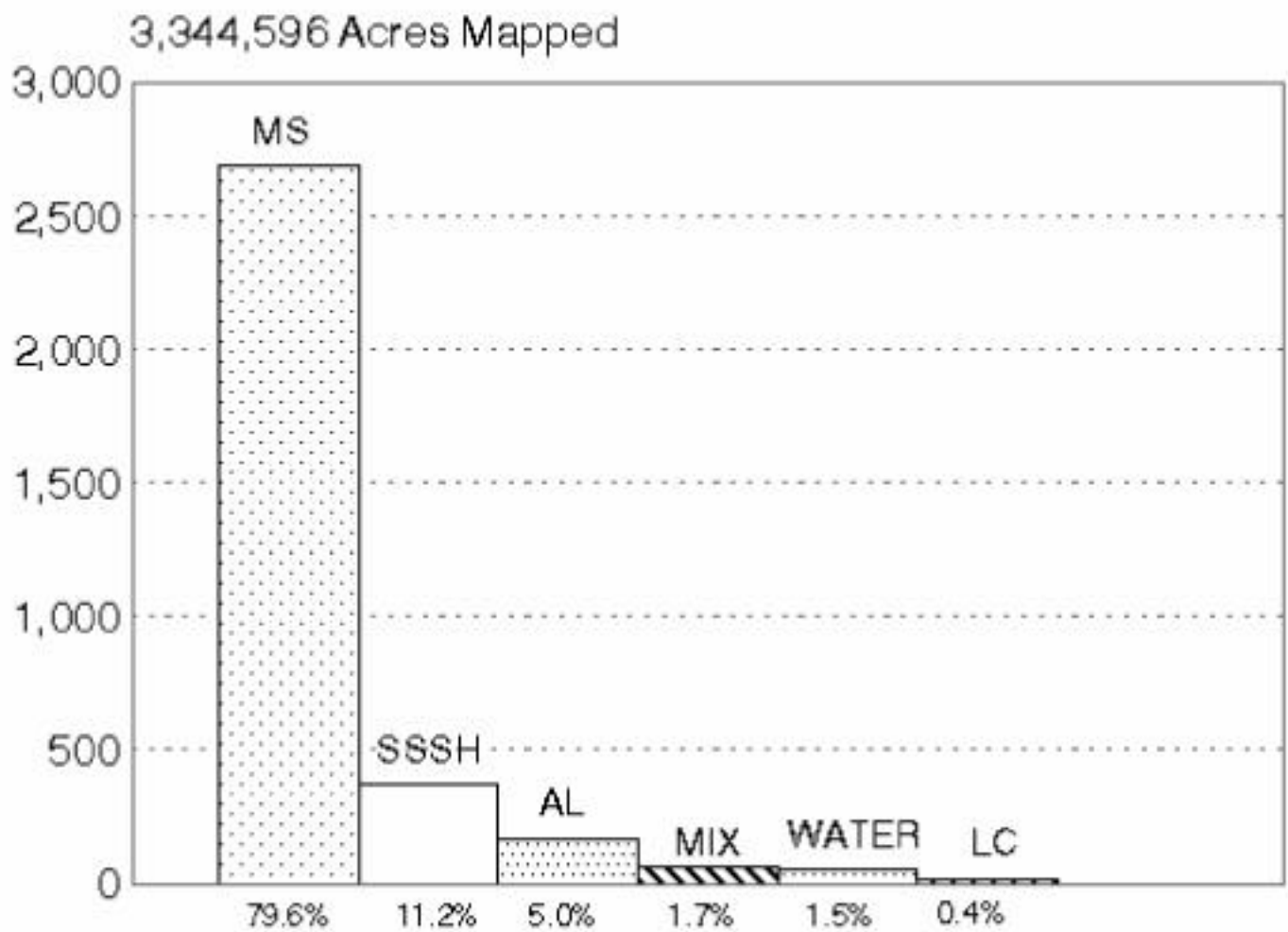
Section M333C: NORTHERN ROCKIES

Landform Composition: Acres Mapped 100% of Total



Section M333C: NORTHERN ROCKIES

Parent Material Composition: Acres Mapped 100% of Total



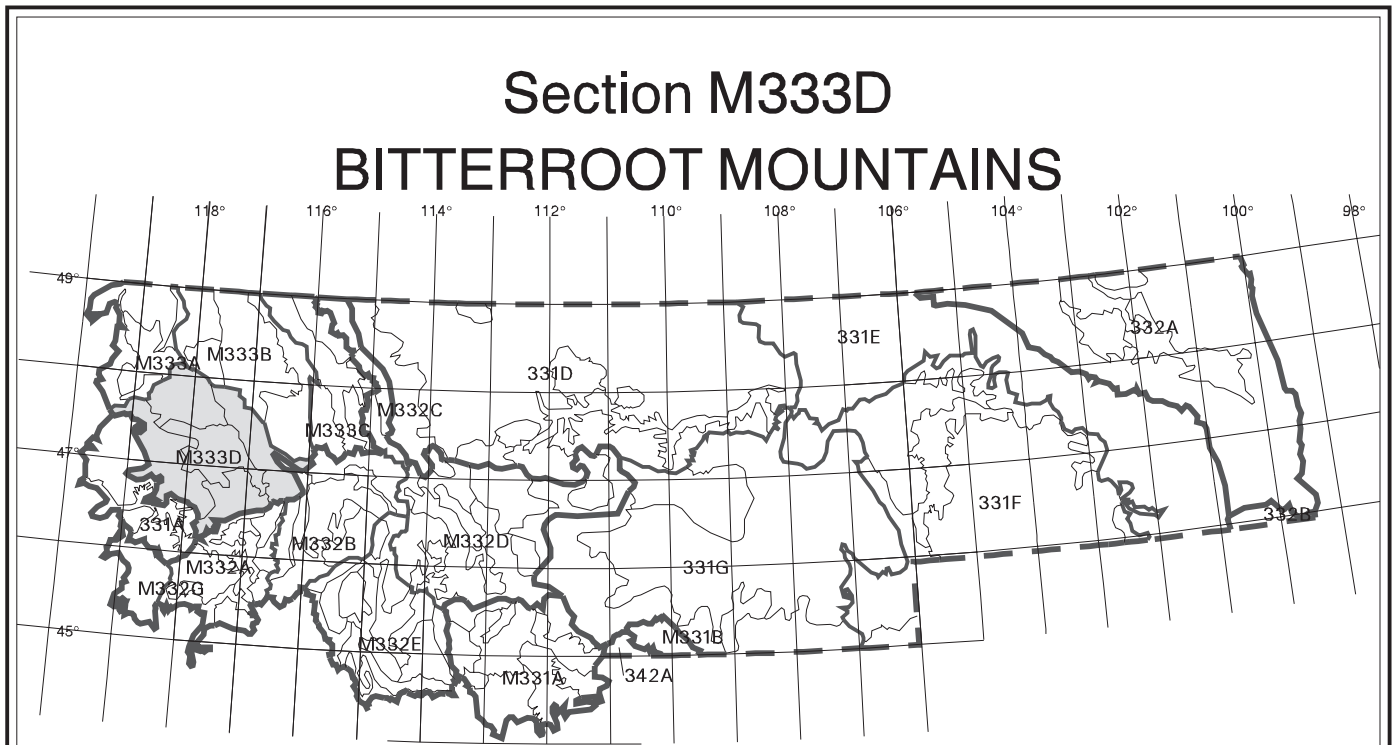
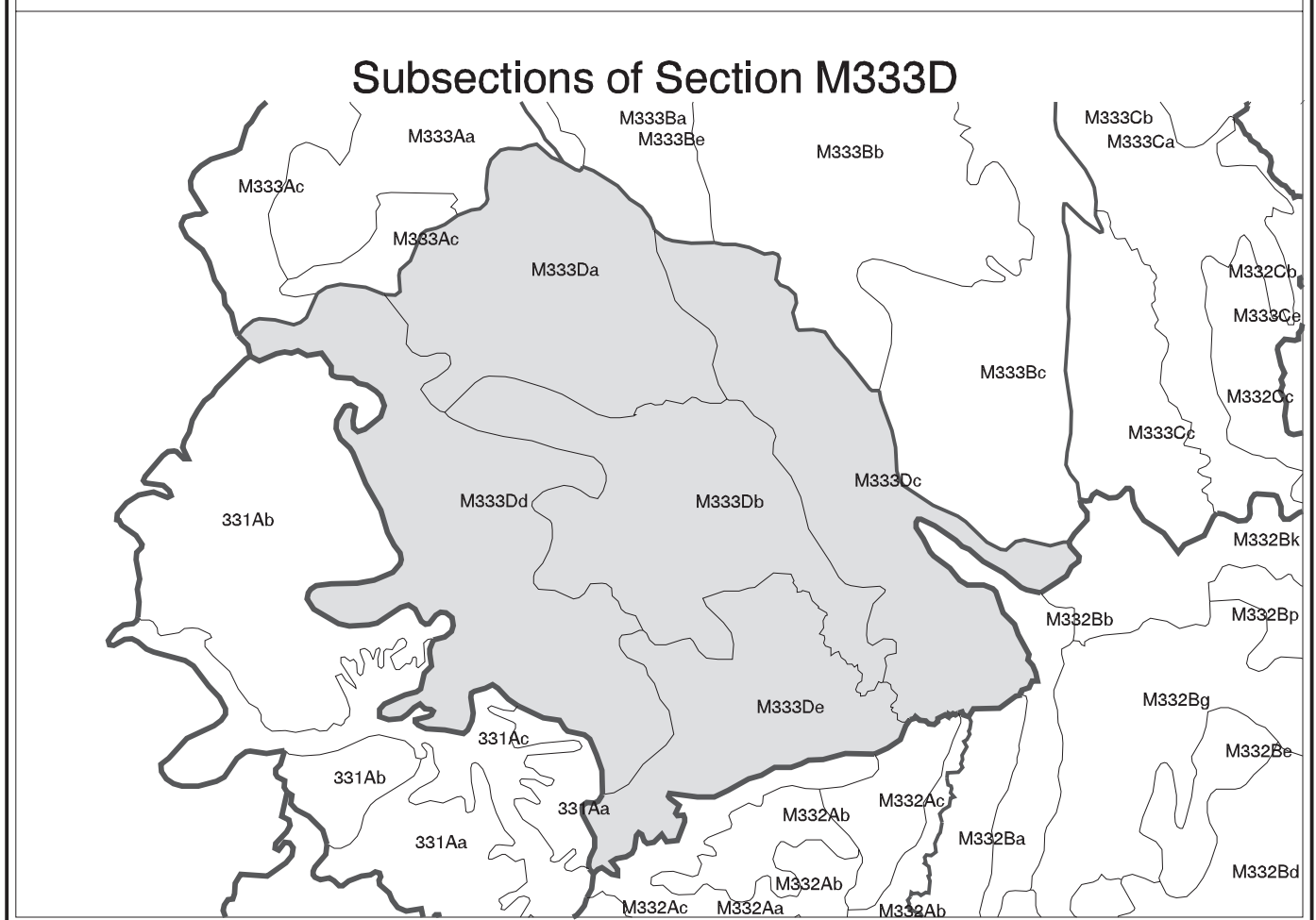


Figure 60



Section M333D



Coeur D'Alene Mountains Idaho Panhandle N.F.

Section M333D

BITTERROOT MOUNTAINS

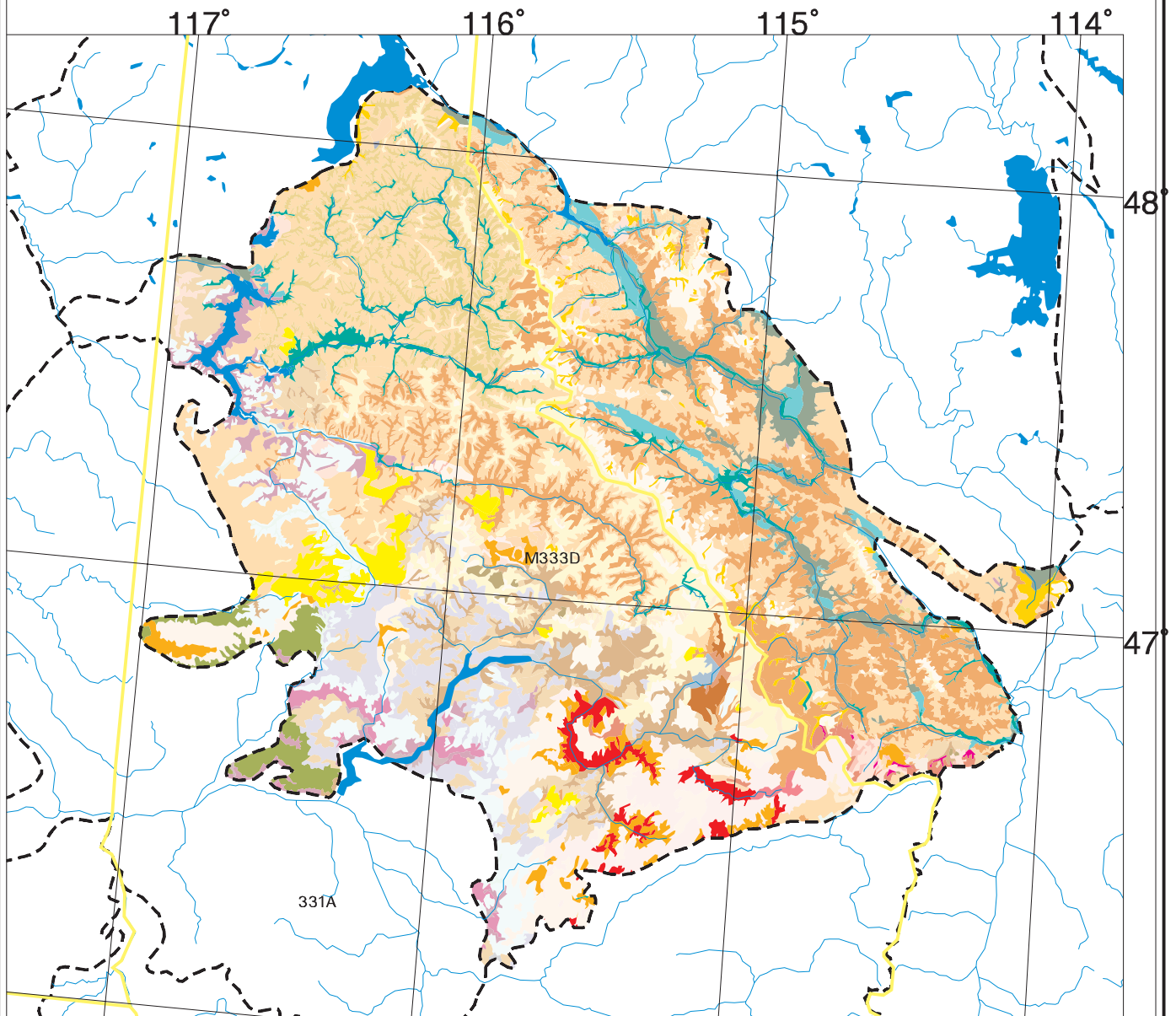
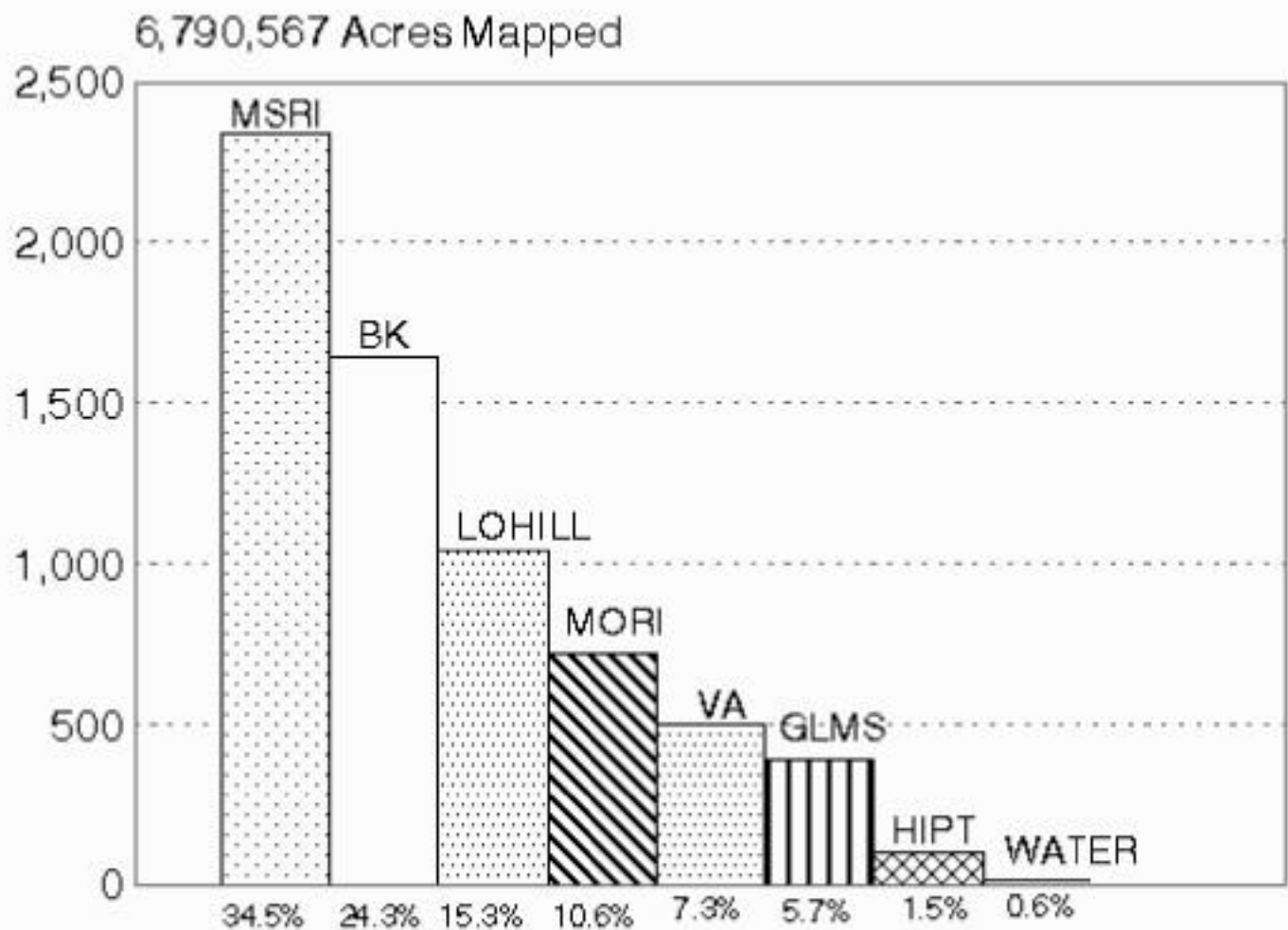


Figure 62

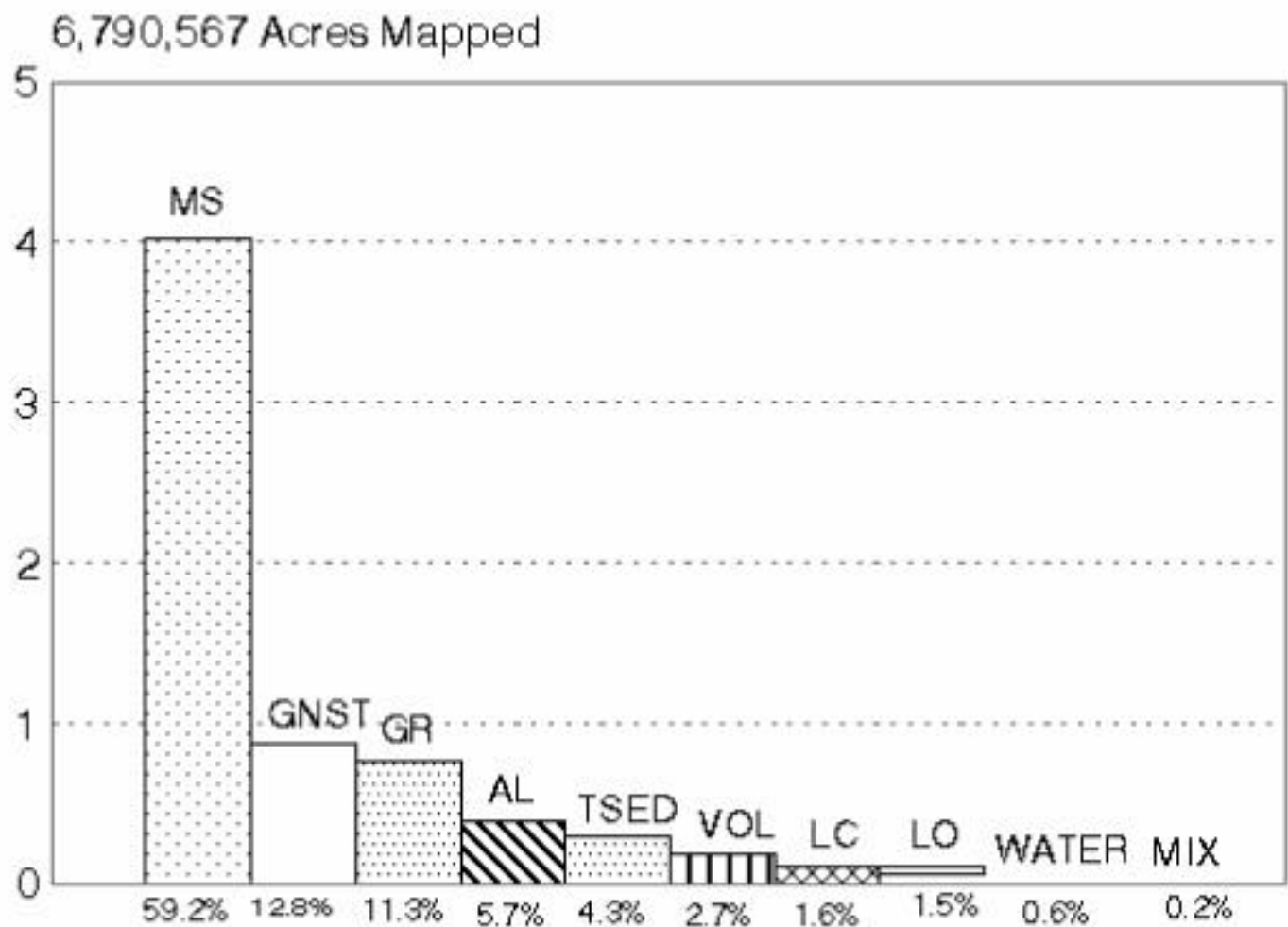
Section M333D: BITTERROOT MOUNTAINS

Landform Composition: Acres Mapped 98% of Total



Section M333D: BITTERROOT MOUNTAINS

Parent Material Composition: Acres Mapped 98% of Total



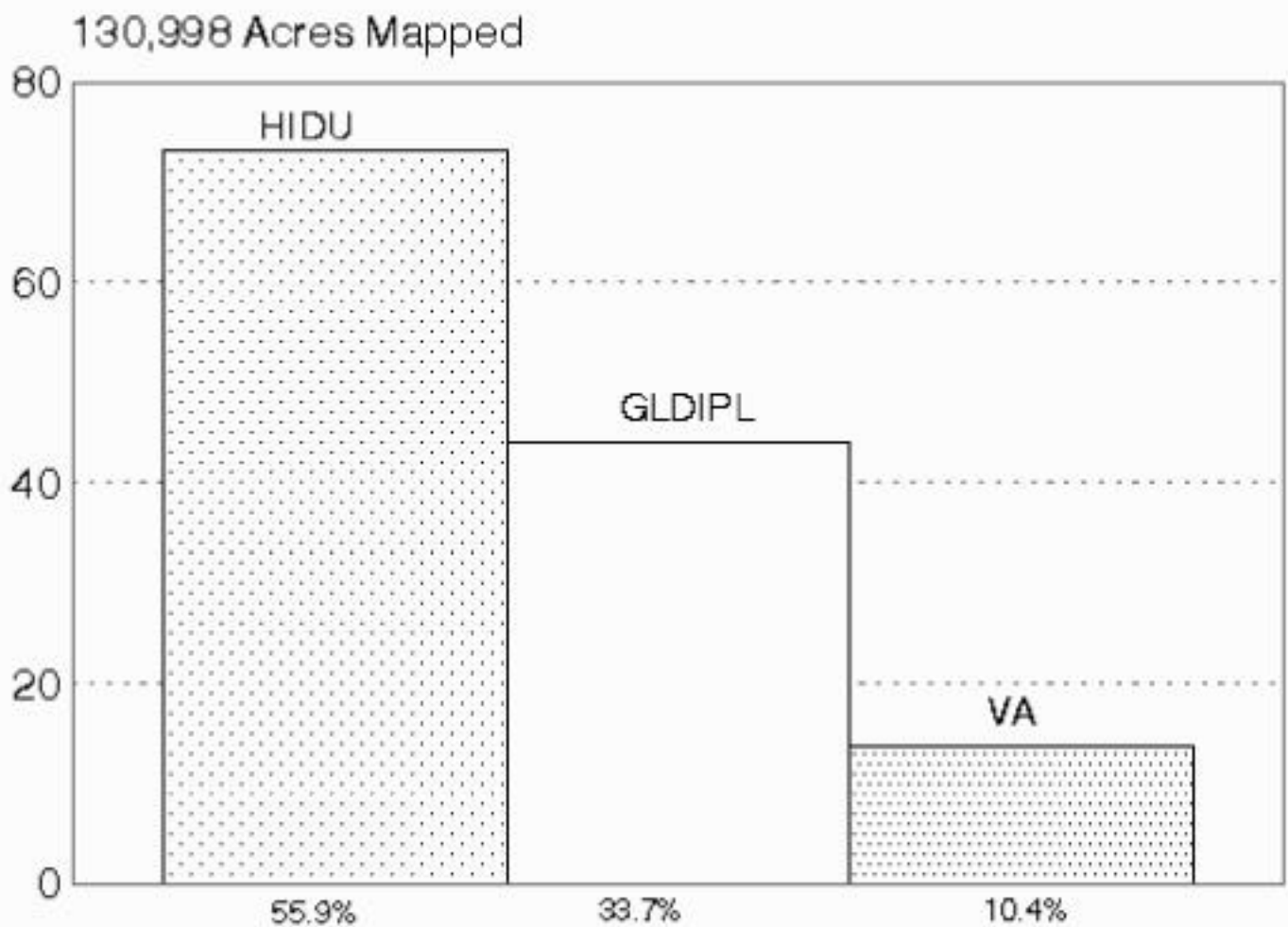
Section 251A



Sheyenne National Grassland Custer N.F.

Section 251A: Red River Valley

Landform Composition: Acres Mapped 1.4% of Total



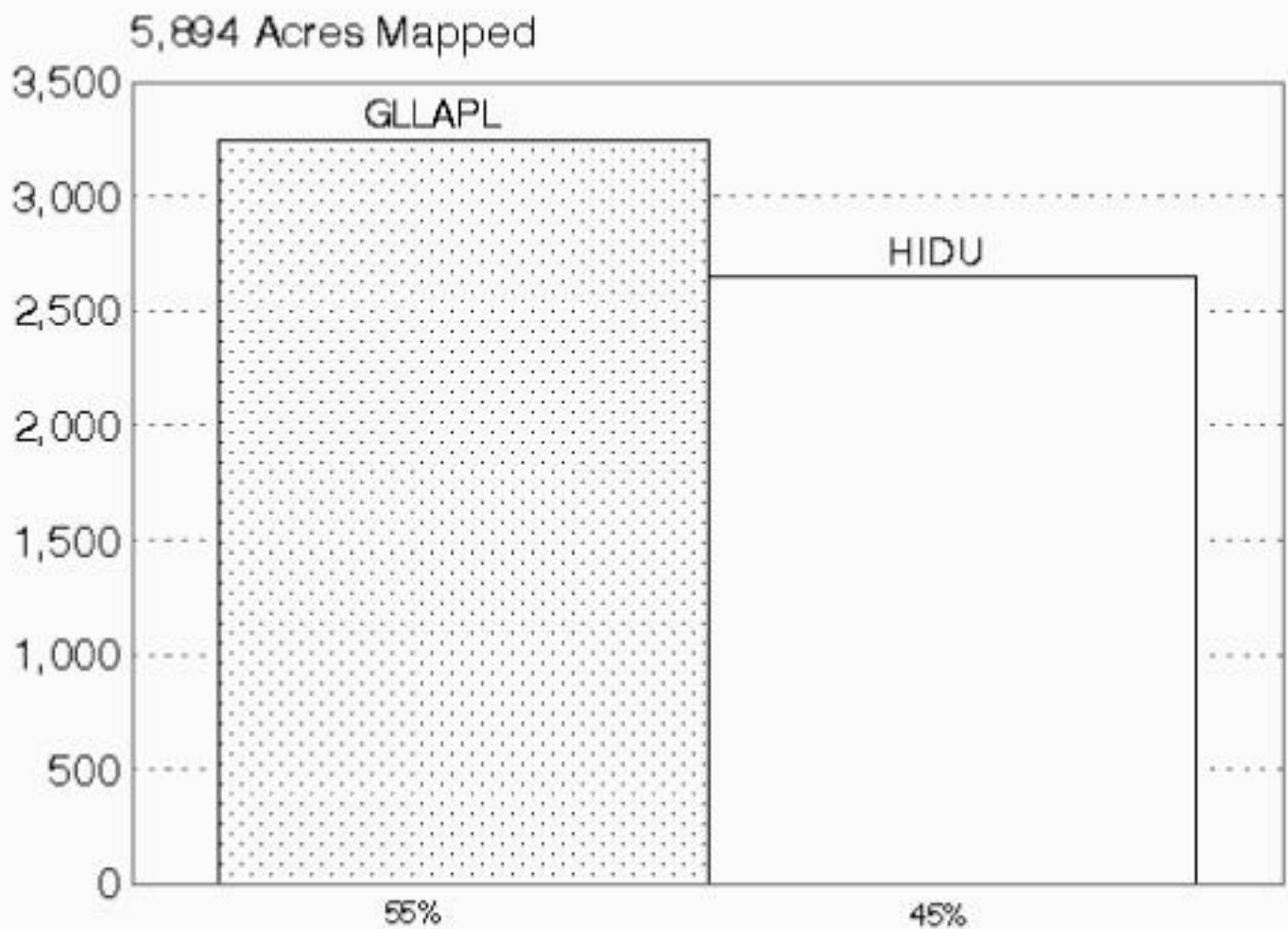
Section 251A: Red River Valley

Parent Material Composition: Acres Mapped 1.4% of Total



Section 251B: North Central Glaciated Plains

Landform Composition: Acres Mapped 0.2% of Total



Sections of the Great Plains

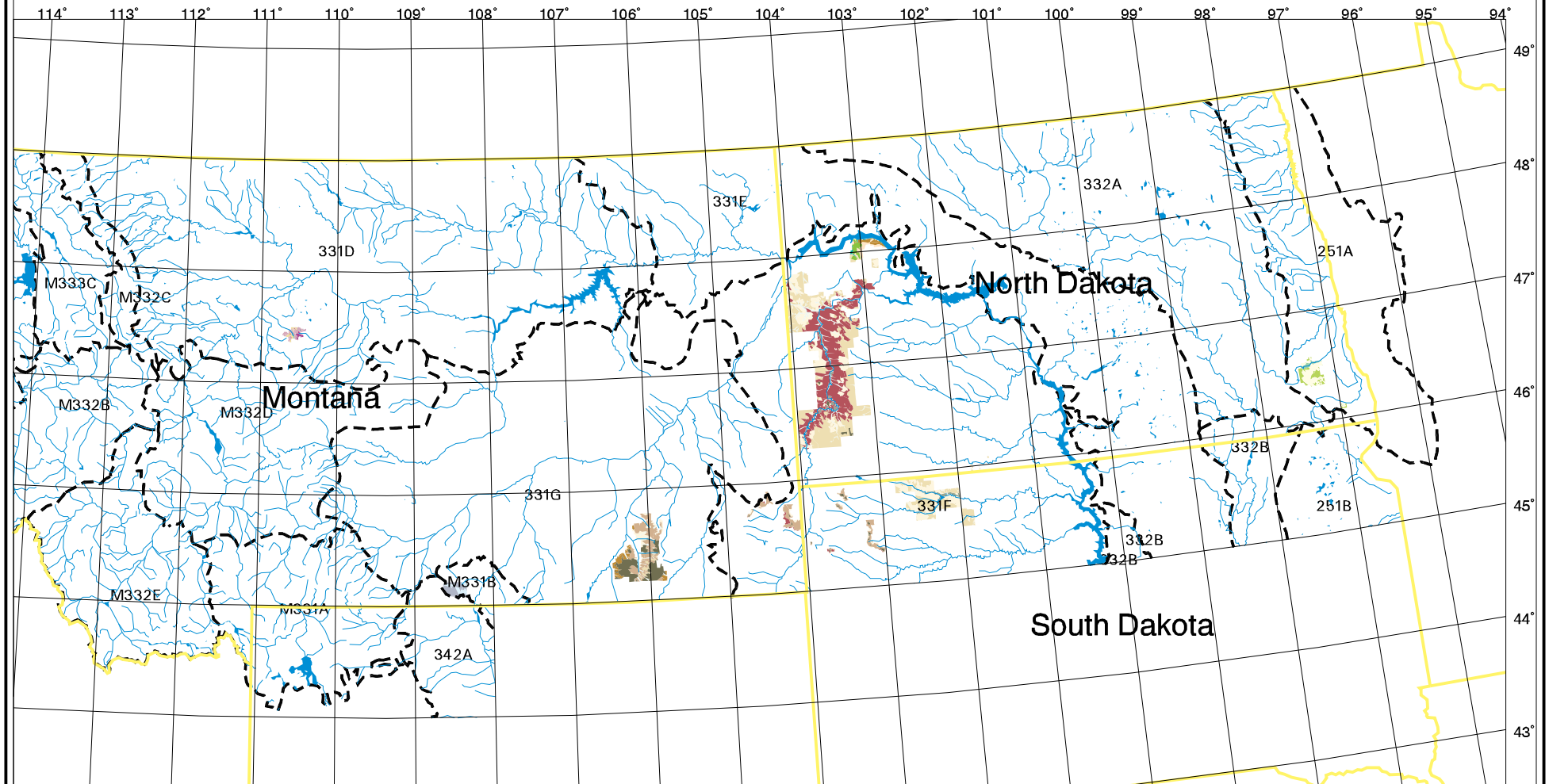
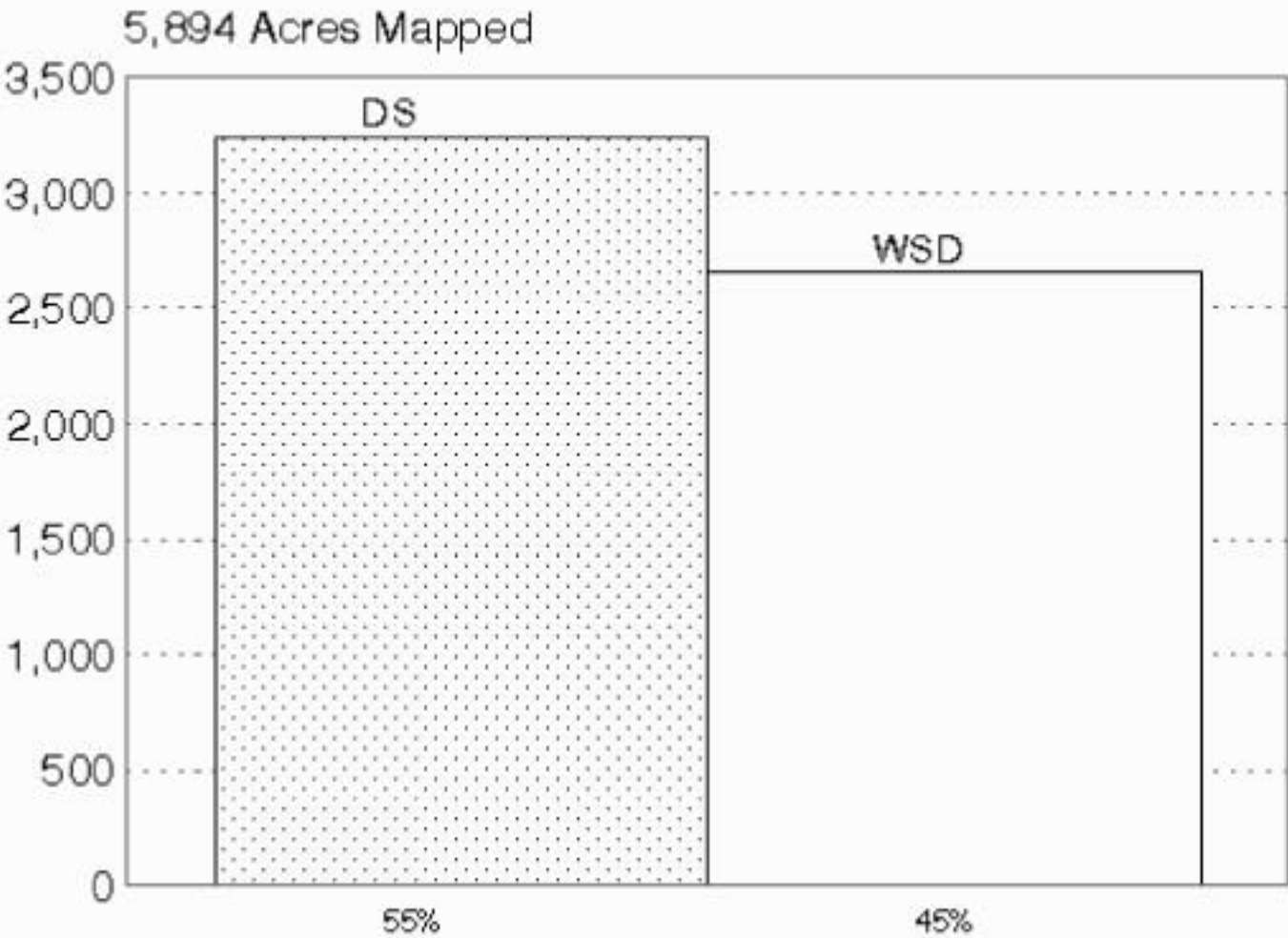


Figure 69

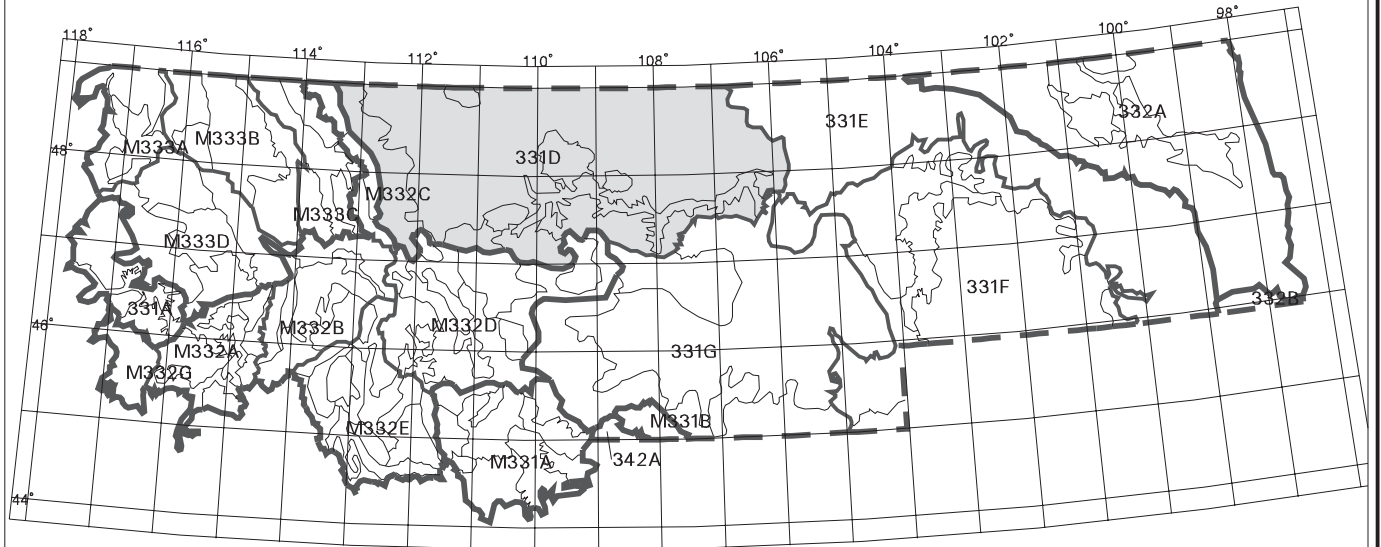
Section 251B: North Central Glaciated Plains

Parent Material Composition: Acres Mapped 0.2% of Total

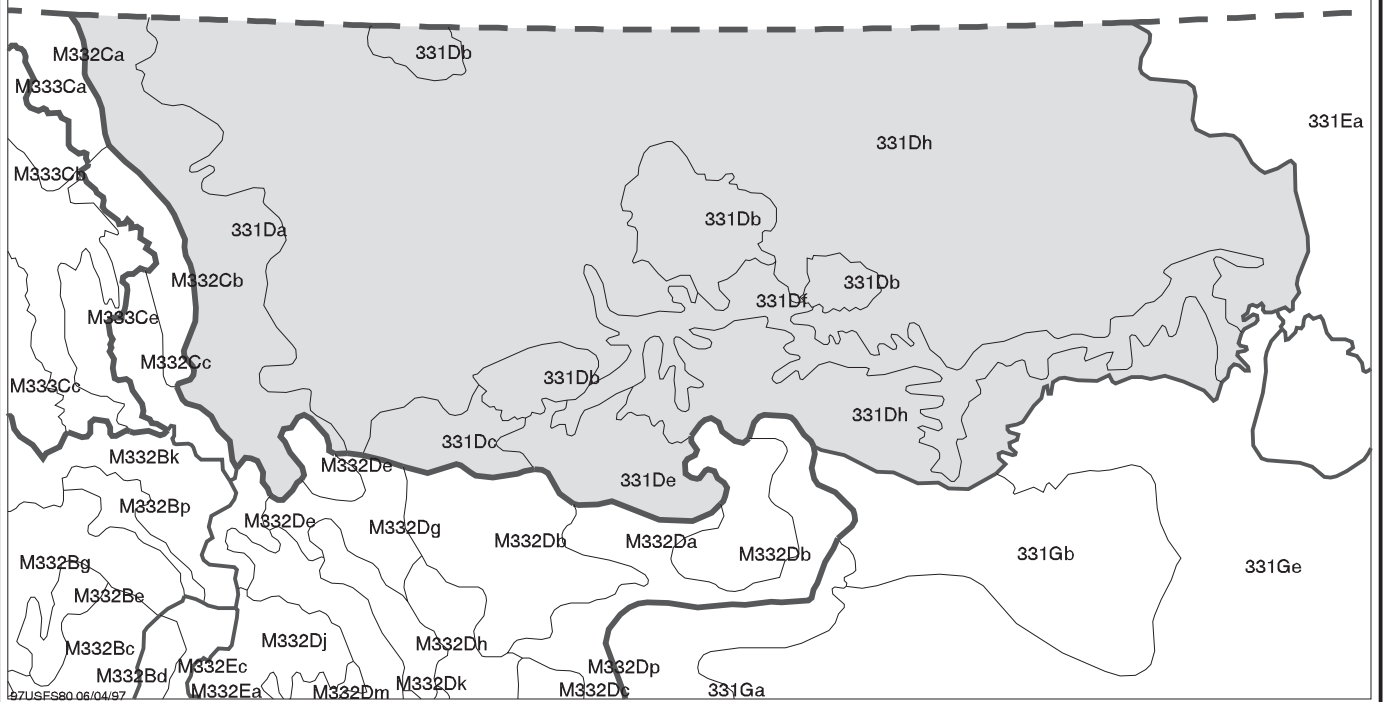


Section 331D

NORTHWESTERN GLACIATED PLAINS

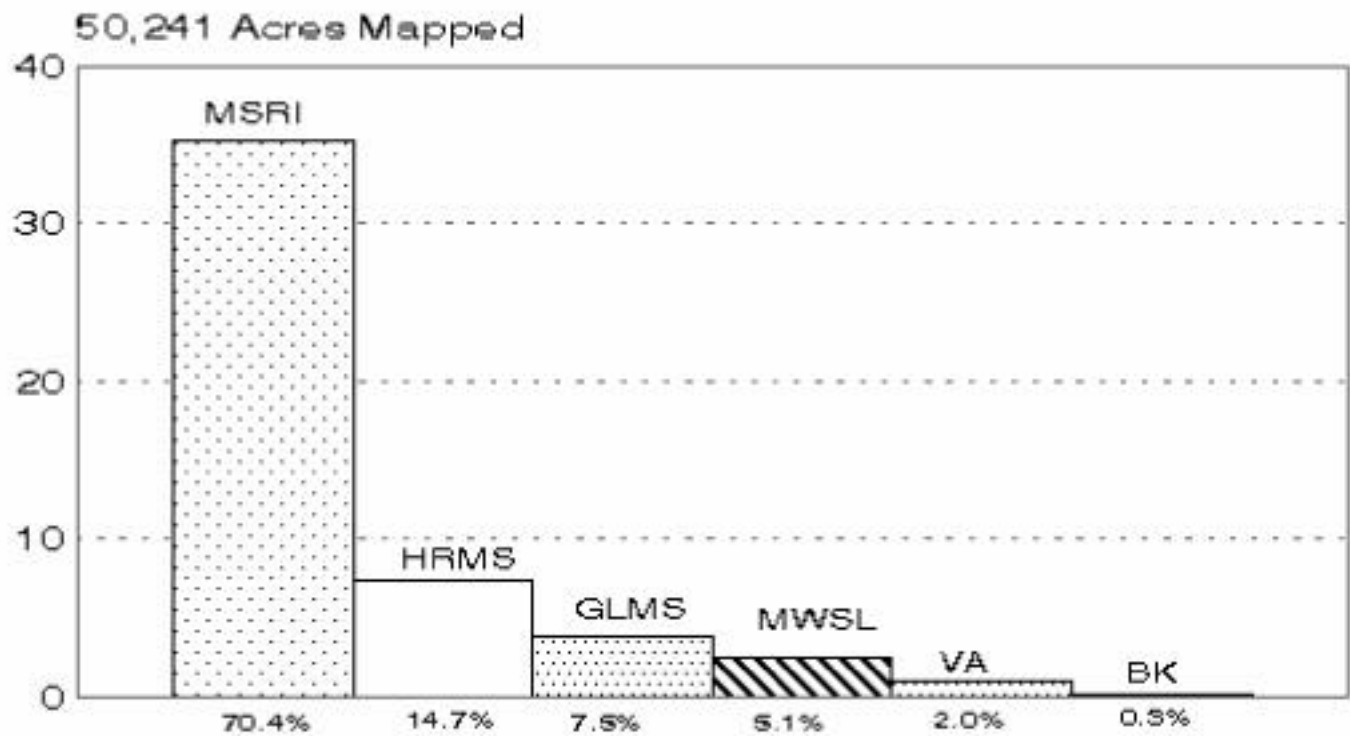


Subsections of Section 331D



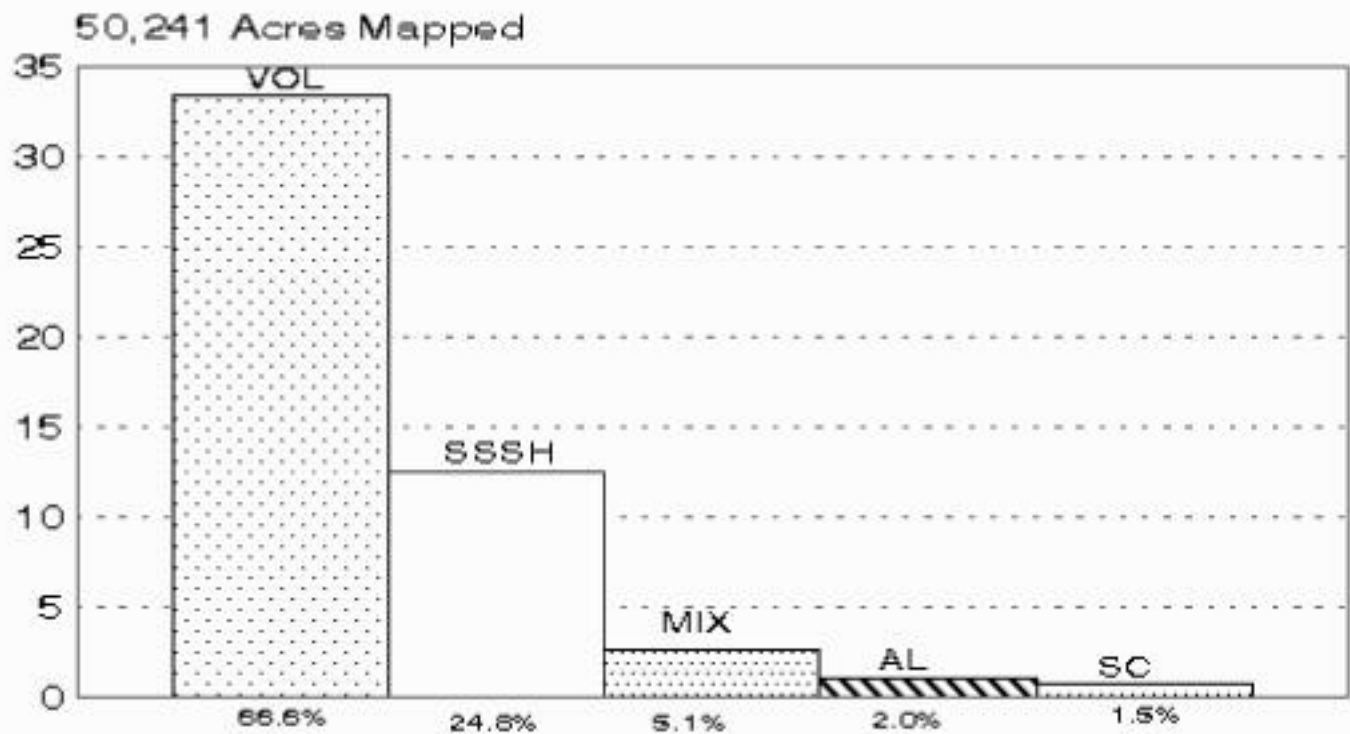
Section 331D: NORTHWESTERN GLACIATED PLAINS

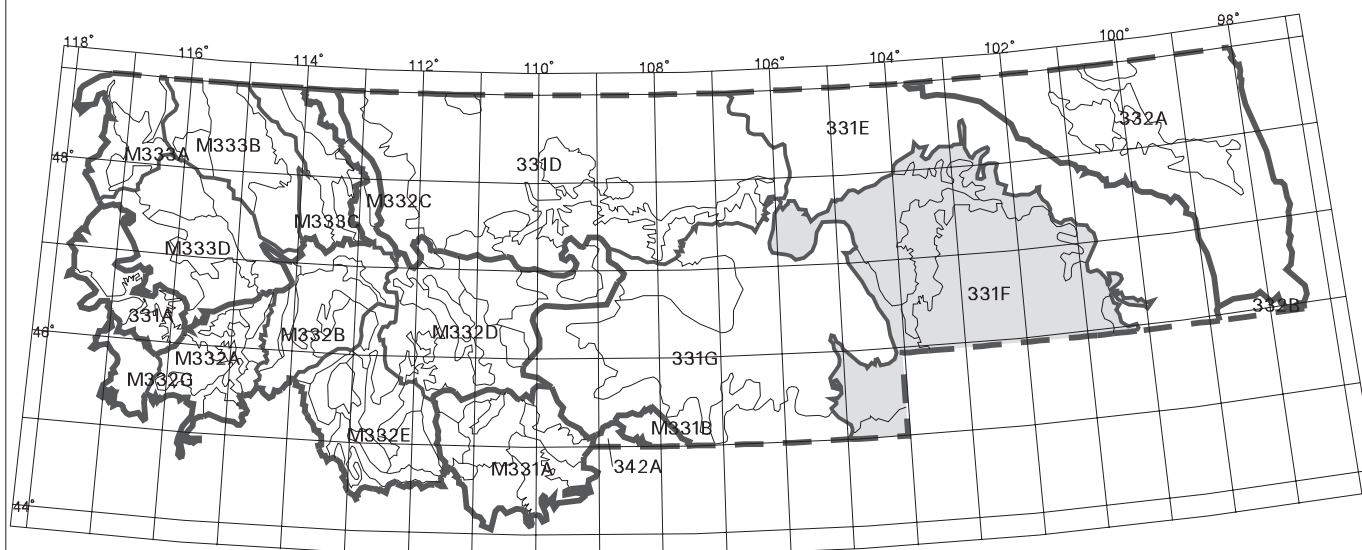
Landform Composition: Acres Mapped 0.2% of Total



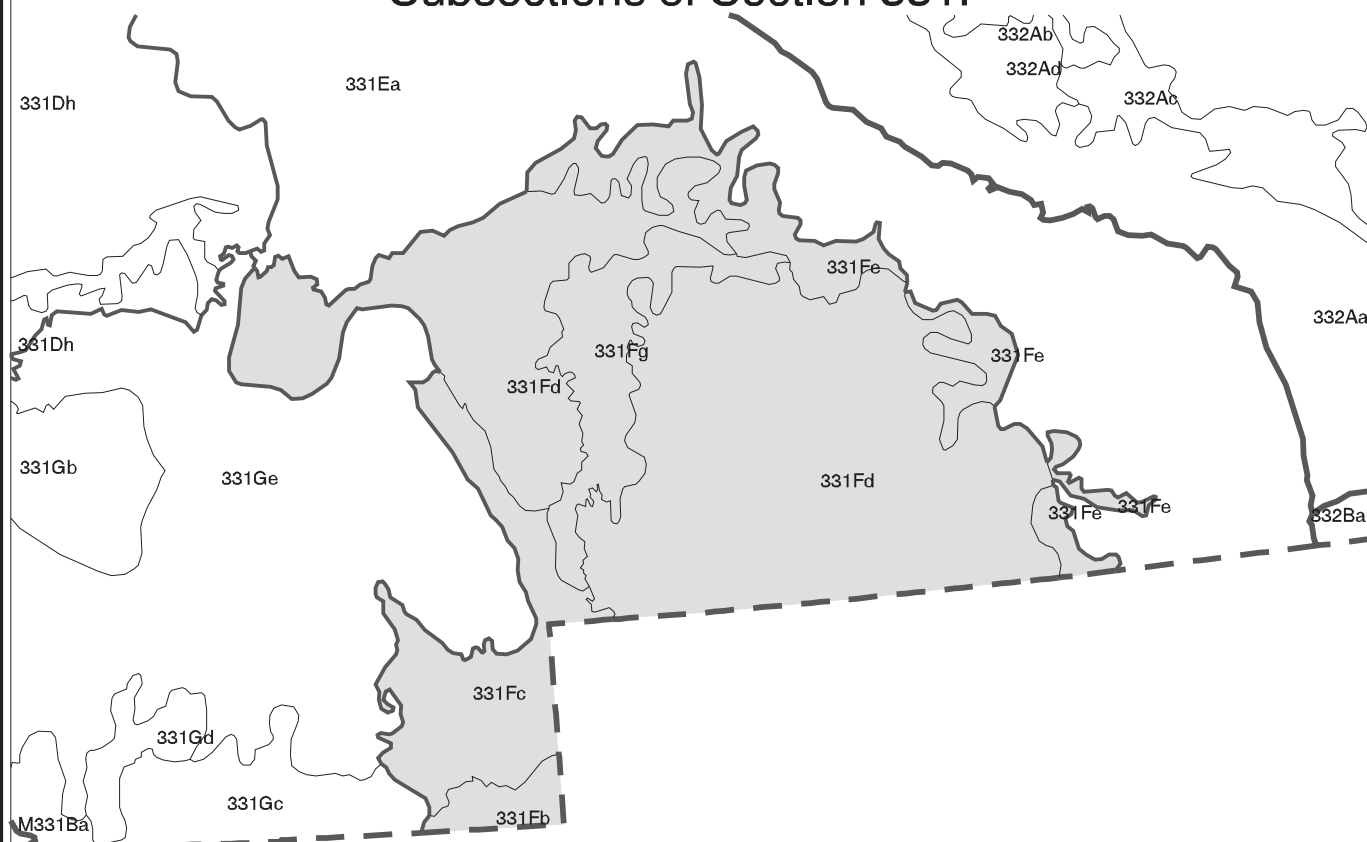
Section 331D: NORTHWESTERN GLACIATED PLAINS

Parent Material Composition: Acres Mapped 0.2% of Total





Subsections of Section 331F



Section 331F



Badlands Custer N.F.

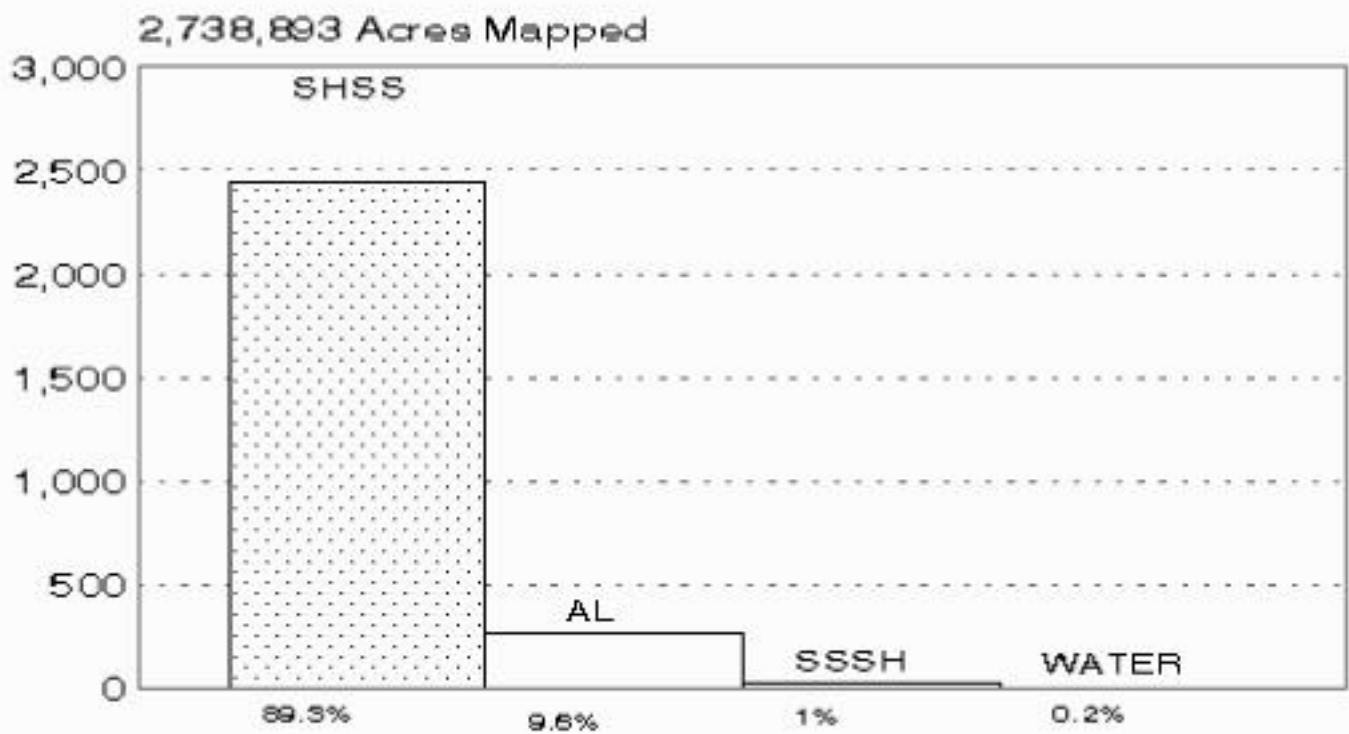
Section 331F



Badlands Custer N.F.

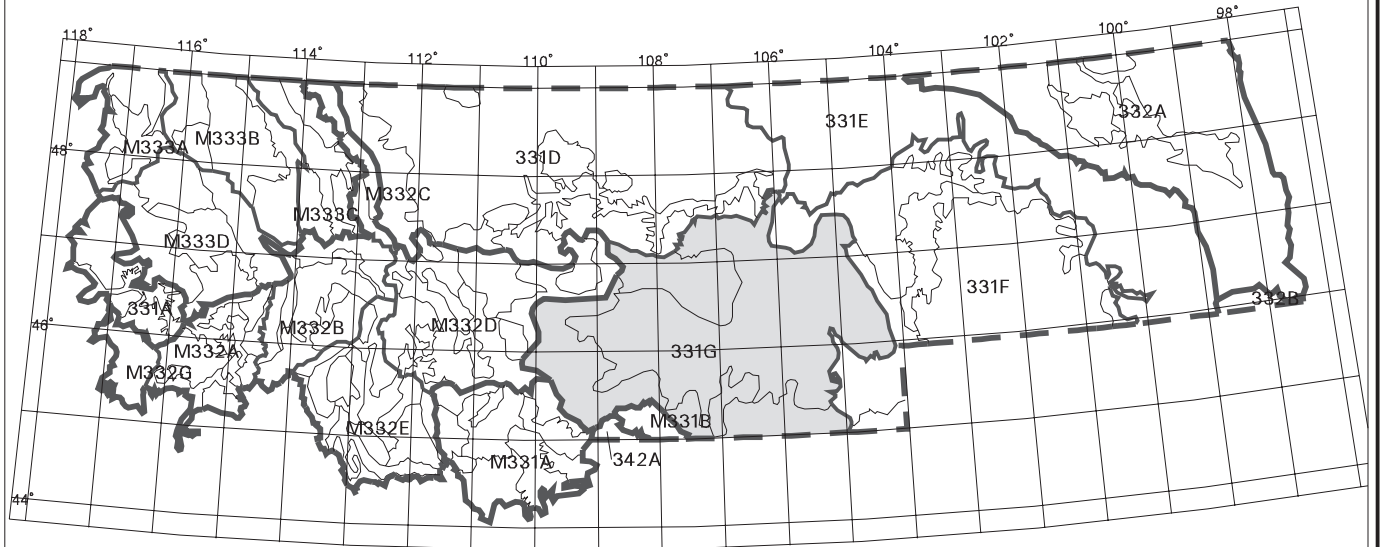
Section 331F: NORTHWESTERN GREAT PLAINS

Parent Material Composition: Acres Mapped 13.7% of Total



Section 331G

POWDER RIVER BASIN



Subsections of Section 331G



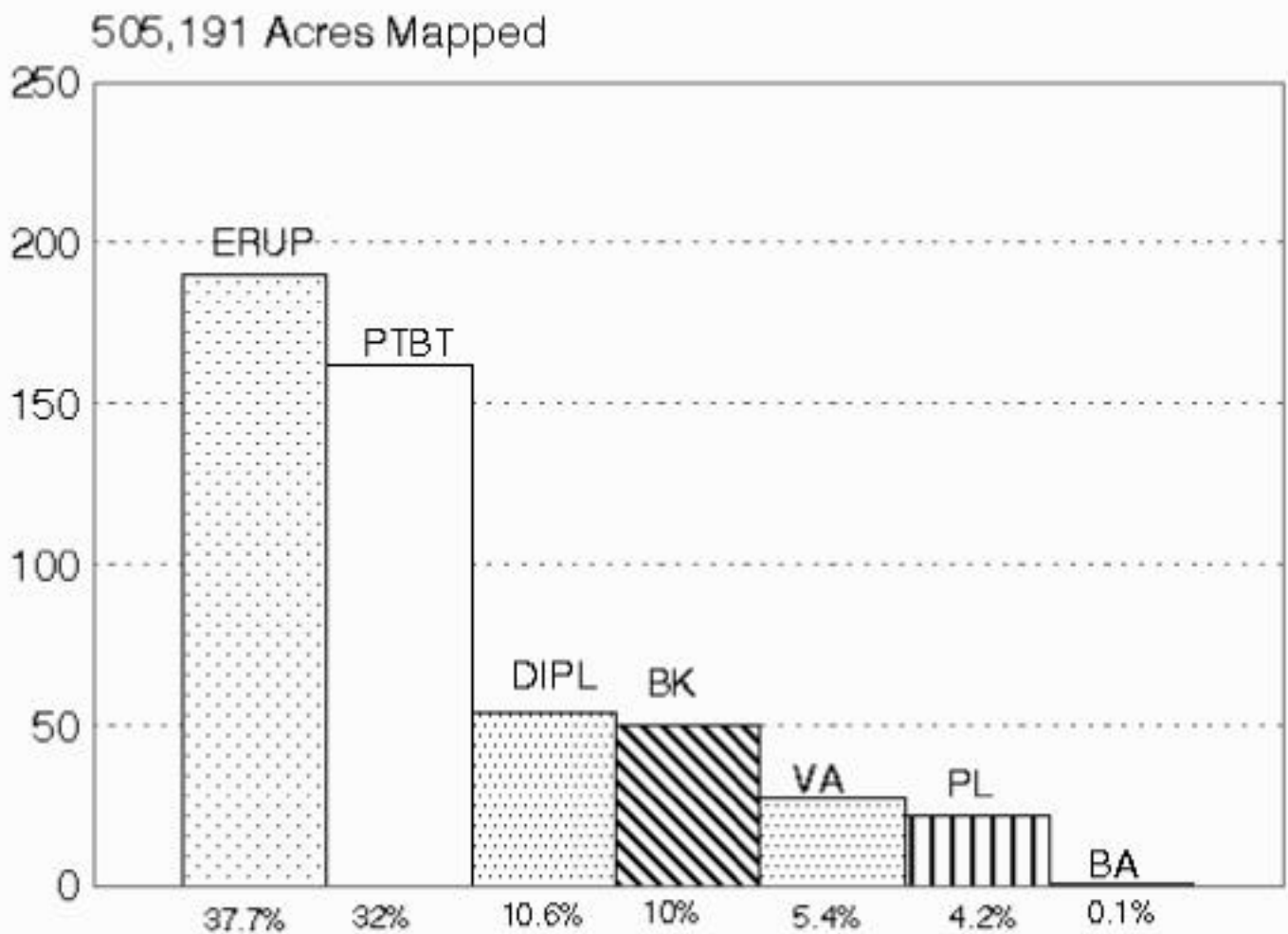
Section 331G



Custer N.F.

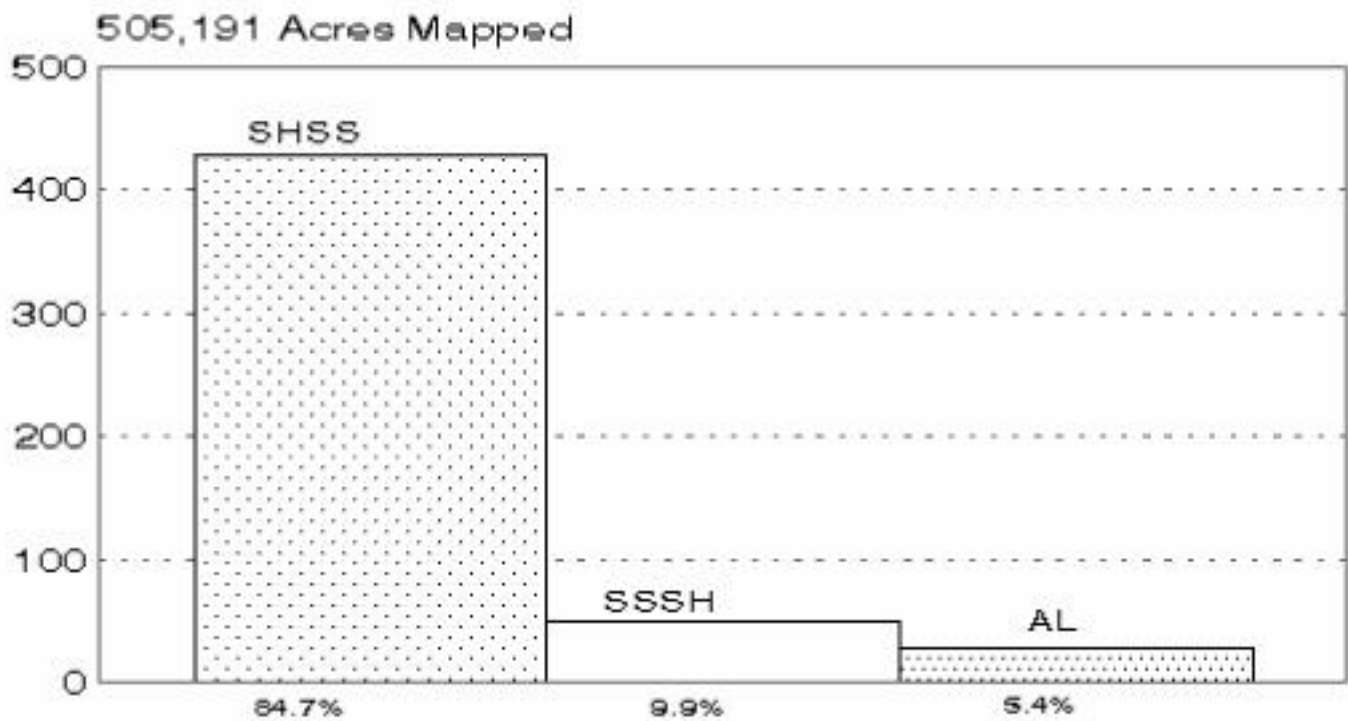
Section 331G: POWDER RIVER BASIN

Landform Composition: Acres Mapped 2.2% of Total

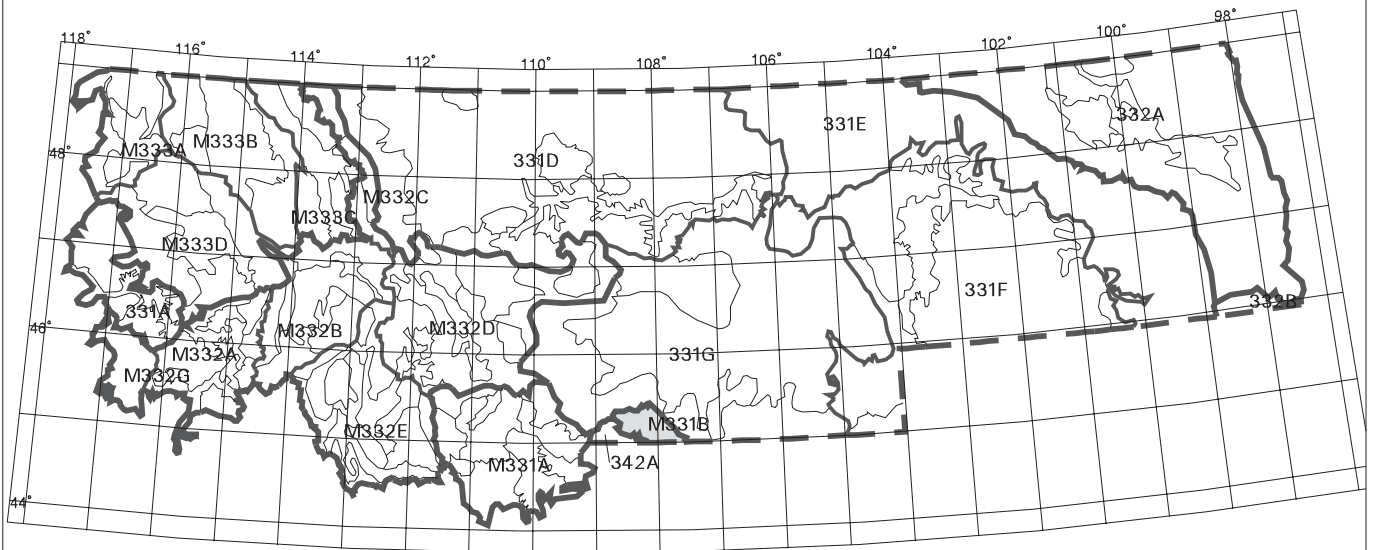


Section 331 G: POWDER RIVER BASIN

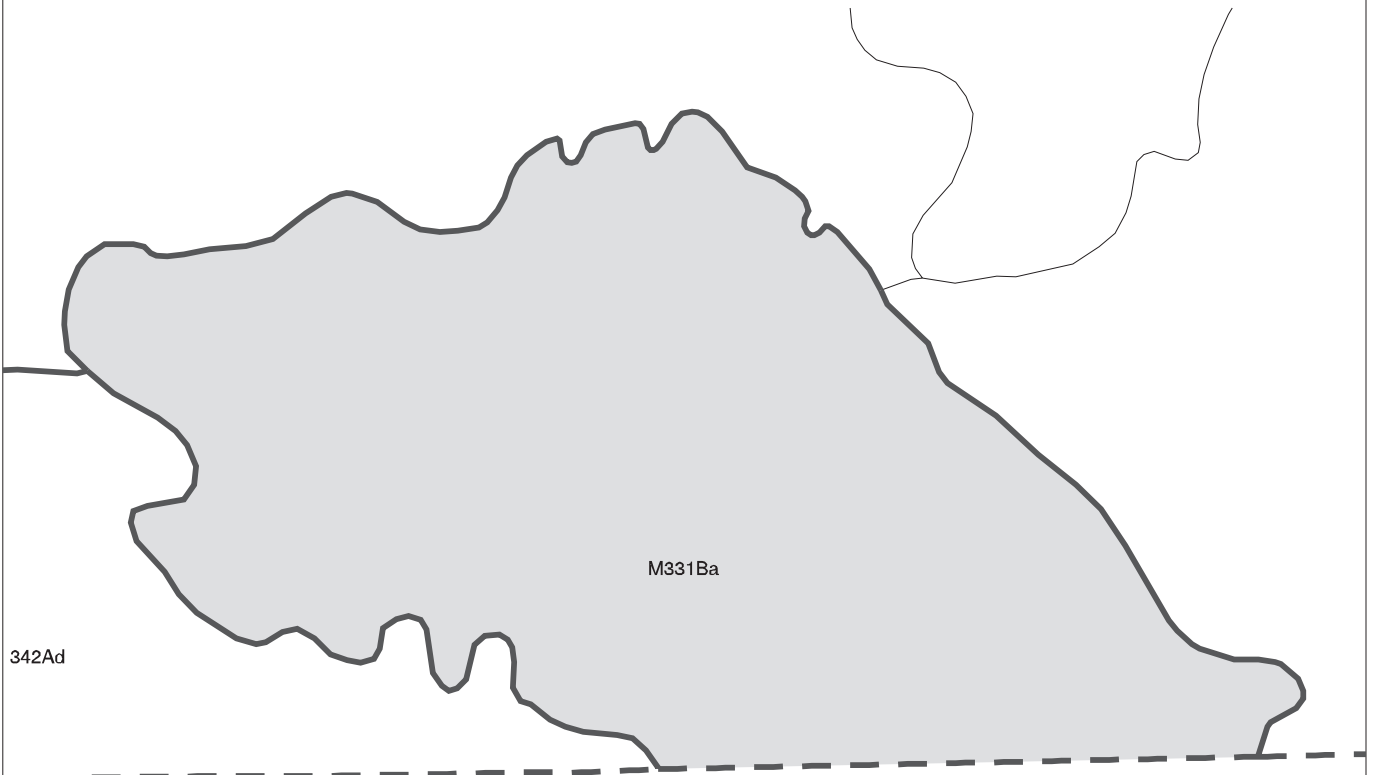
Parent Material Composition: Acres Mapped 2.2% of Total



Section M331B BIGHORN MOUNTAINS



Subsections of Section M331B



Geologic Material Landform Categories

ALLUVIUM/DEPOSITIONAL

-  10 Recent Deposits, Coarse
-  14 Recent Deposits, Fine
-  11 Lacustrine
-  12 Glacial Terraces, Fans, Outwash, Coarse
-  13 Glacial Terraces, Fans, Outwash, Fine
-  17 Loess Deposits
-  83 Tertiary Sediments, Fine
-  88 Tertiary Sediments, Coarse
-  69 Pediment, Undifferentiated
-  8 Glacial Deltaic Sediments
-  9 Sand Hills and Sand Dunes
-  99 Lakes and Reservoirs

CARBONATES

-  27 Breaks
-  37 Steep Mountain Slopes
-  66 Mountain Slopes and Ridges
-  43 Steep Mtn Slopes, Glaciated

SHALES, SILTSTONES, SANDSTONES

-  1 Rolling Plains
-  2 Rolling Plains, Glaciated
-  3 Dissected Plains
-  4 Dissected Plains, Glaciated
-  5 Badlands
-  6 Eroded Uplands (Volcanic Tuffs)
-  7 Plateaus and Buttes

SANDSTONES and SHALES

-  25 Breaks
-  36 Steep Mountain Slopes
-  68 Mountain Slopes and Ridges
-  65 Mountain Slopes and Ridges, Soft Sedimentary
-  74 Mountain Ridge Tops
-  44 Steep Mtn Slopes, Glaciated
-  53 Mtn Slopes and Ridges, Glaciated

MASS FAILURE

-  90 Mass Wasted
-  92 Colluvial Deposits

Geologic Material Landform Categories

BELT SERIES

-  20 Breaks
-  28 Dissected Breaks
-  60 Mountain Slopes and Ridges
-  70 Mountain Ridge Tops
-  80 Rolling Hills
-  40 Steep Mountain Slopes, Glaciated
-  50 Mtn Slopes and Ridges, Glaciated
-  47 Glacial Trough Walls
-  58 Glacial Till, Highly WX

GNEISS and SCHISTS

-  23 Breaks
-  26 Breaks, Mod. WX
-  63 Mountain Slopes and Ridges
-  59 Mountain Slopes and Ridges
-  77 Mountain Ridge Tops
-  84 Rolling Hills, Highly WX
-  85 Rolling Hills, Mod. WX
-  39 Steep Mtn Slopes, Glaciated
-  57 Mtn Slopes and Ridges, Glaciated

GRANITICS

-  21 Breaks, Highly WX
-  22 Breaks, Weakly WX
-  61 Mtn Slopes and Ridges, Highly WX
-  71 Mountain Ridge Tops, Highly WX
-  81 Rolling Hills
-  62 Mtn Slopes and Ridges, Weakly WX
-  72 Mountain Ridge Tops, Weakly WX
-  41 Steep Mtn Slopes, Glaciated
-  51 Mtn Slopes and Ridges, Glaciated
-  46 Glaciated Trough Walls
-  45 Mtn Slopes, Weakly Glaciated

VOLCANICS

-  24 Breaks
-  34 Steep Mountain Slopes
-  64 Mtn Slopes and Ridges
-  73 Mountain Ridge Tops
-  82 Rolling Hills
-  42 Steep Mtn Slopes, Glaciated
-  54 Mtn Slopes and Ridges, Glaciated

QUARTZITES and CALC - SILICATES

-  29 Breaks
-  67 Mtn Slopes and Ridges, Highly WX
-  75 Mountain Ridge Tops
-  35 Mtn Slopes and Ridges, Weakly Glaciated

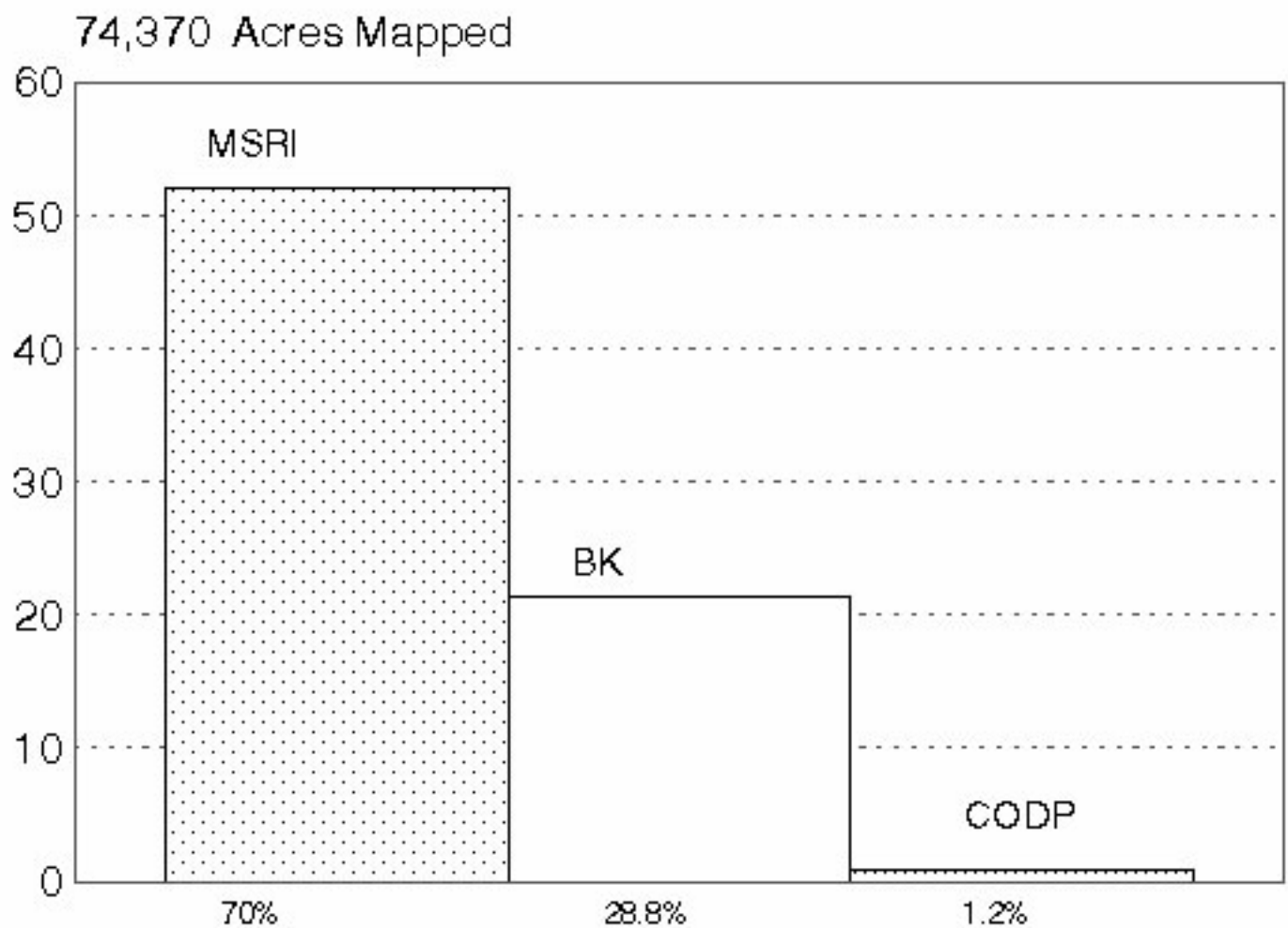
Section M331B



Pryor Mountains Custer N.F.

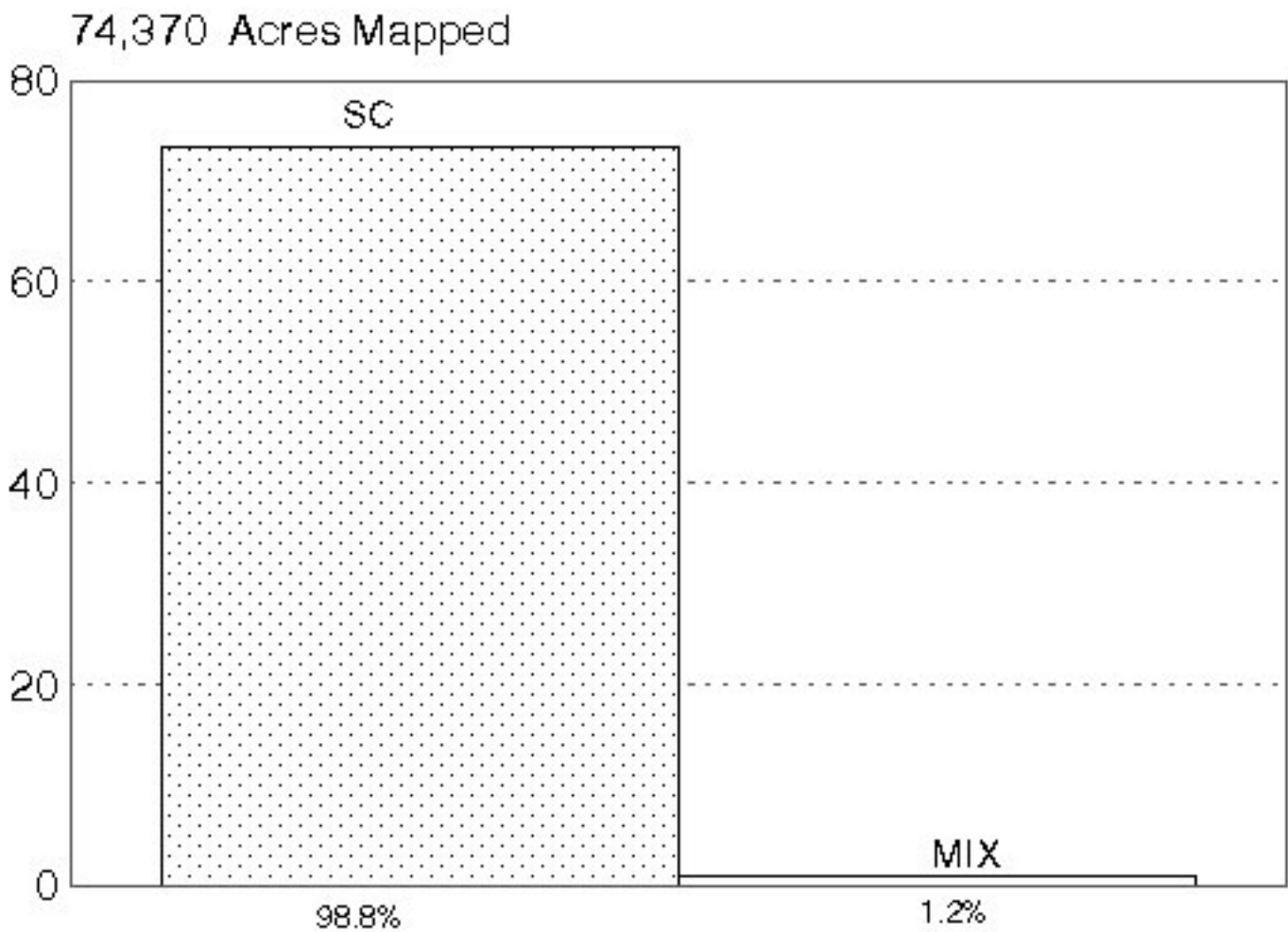
Section M331B: BIGHORN MOUNTAINS

Landform Composition: Acres Mapped 11% of Total

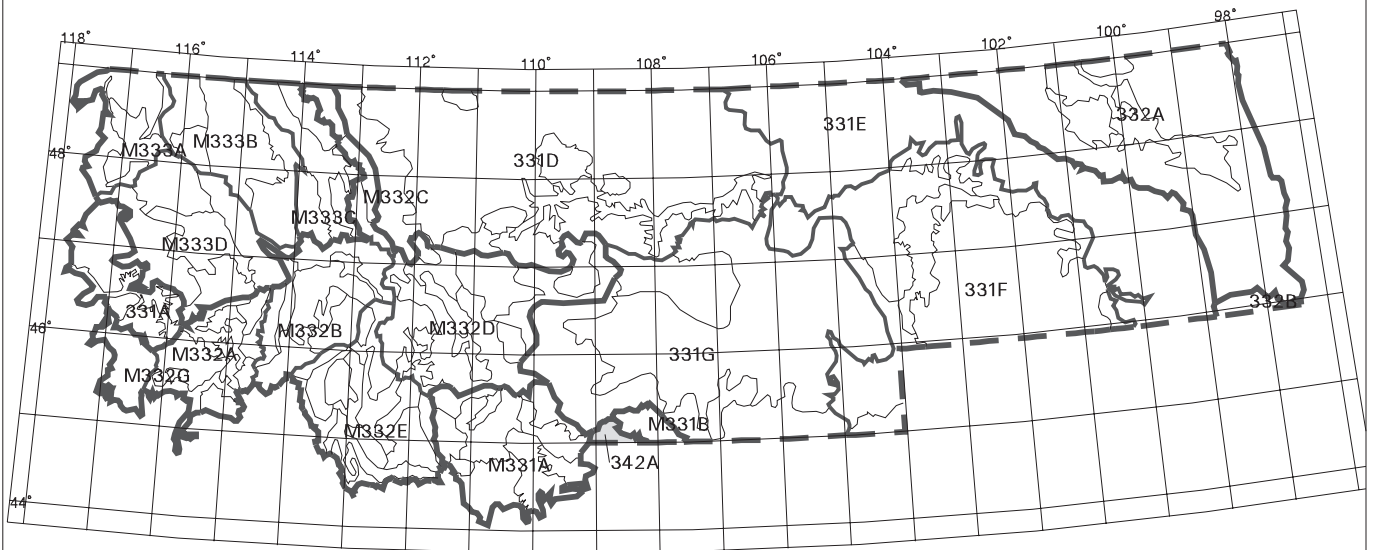


Section M331B: BIGHORN MOUNTAINS

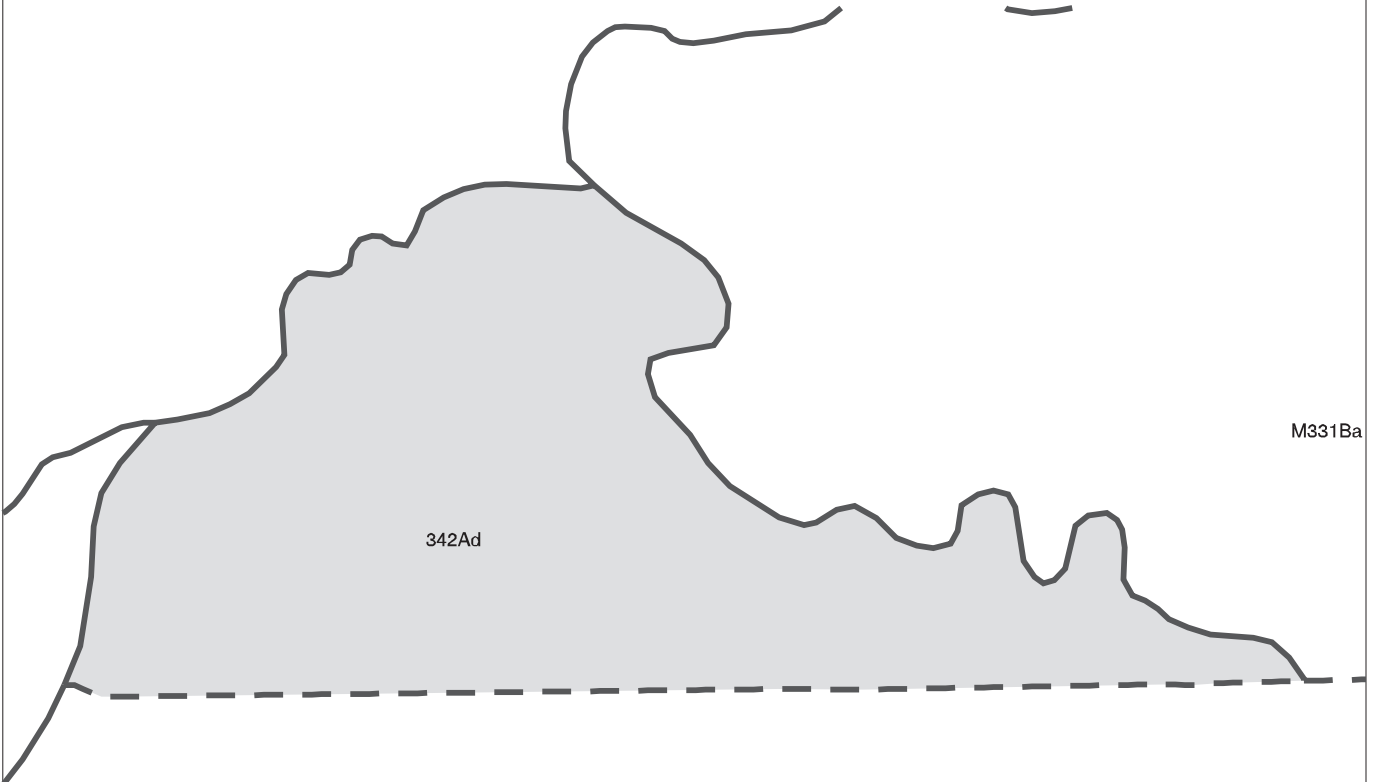
Parent Material Composition: Acres Mapped 11% of Total



Section 342A BIGHORN BASIN

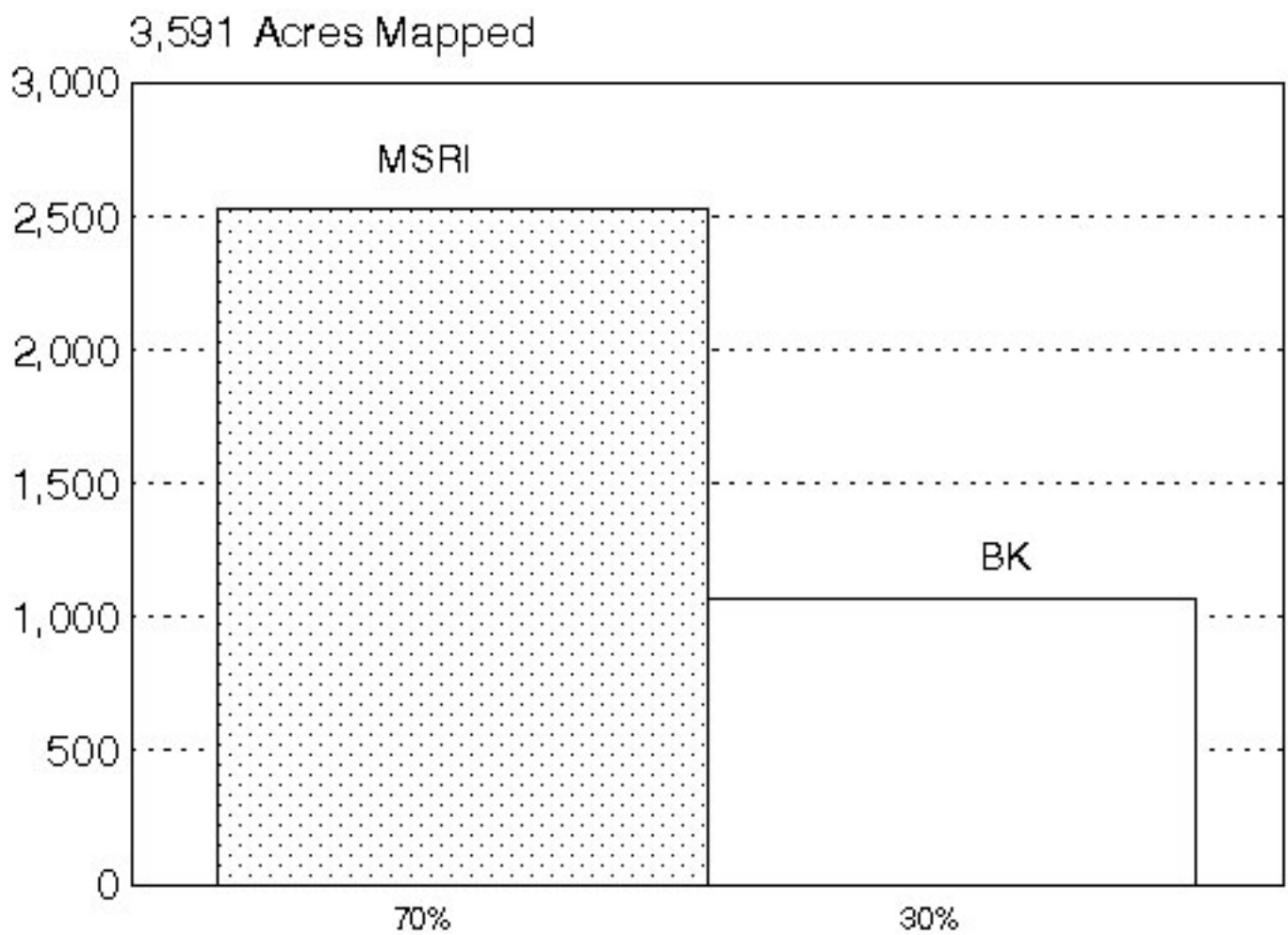


Subsections of Section 342A



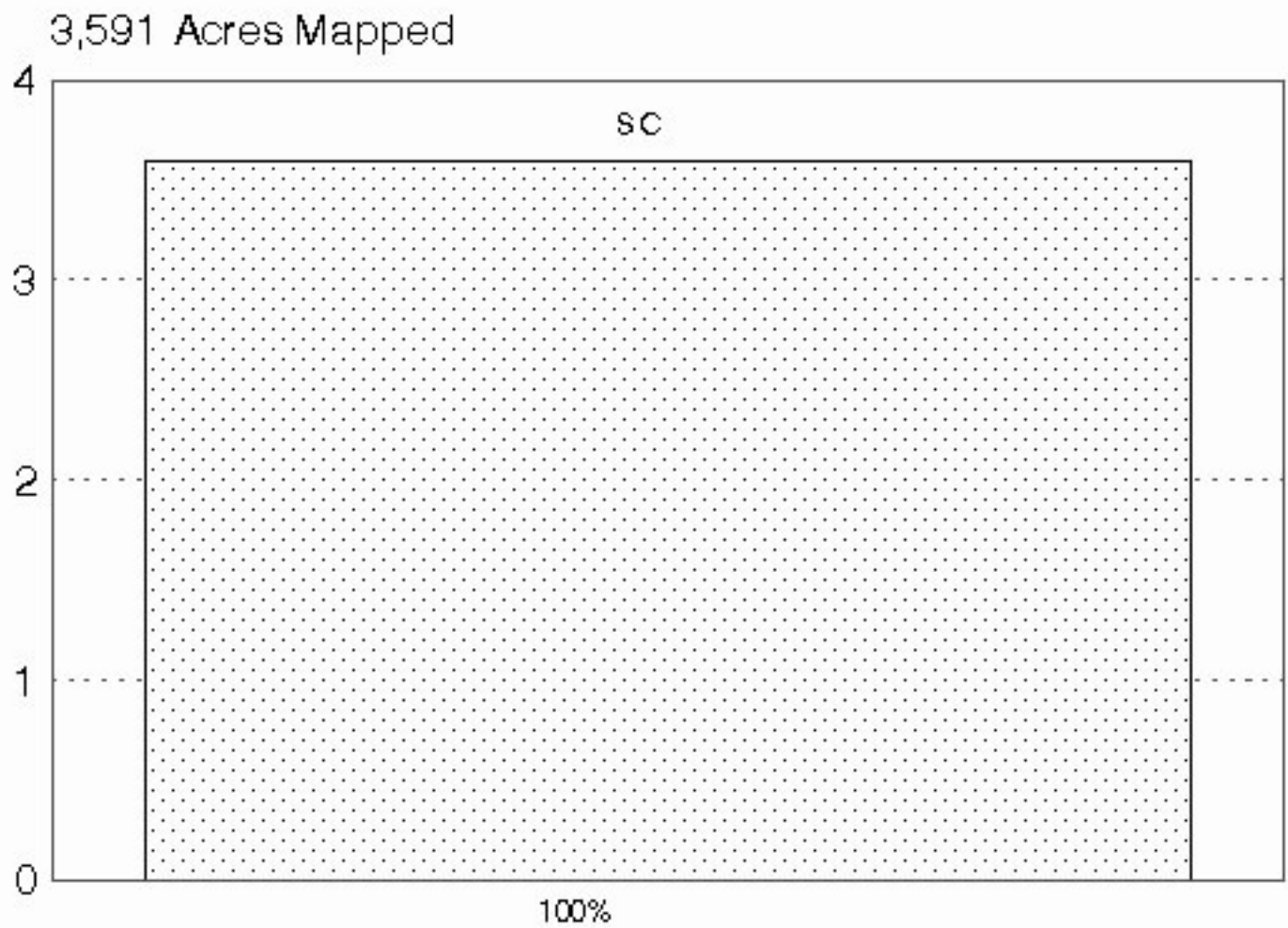
Section 342A: BIGHORN BASIN

Landform Composition: Acres Mapped 1.2% of Total

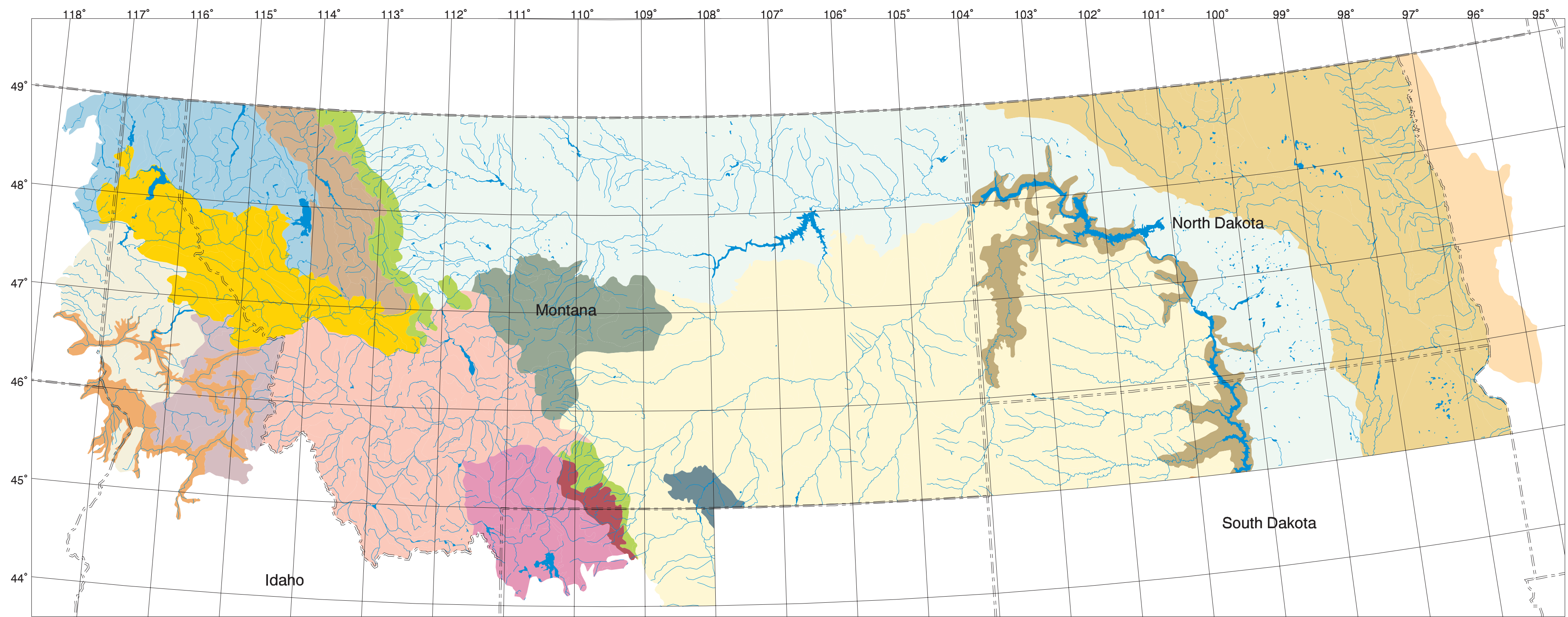


Section 342A: BIGHORN BASIN

Parent Material Composition: Acres Mapped 1.2% of Total



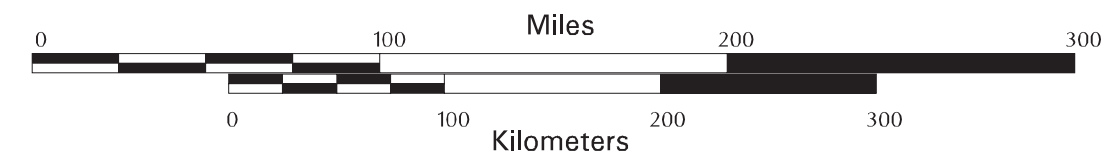
Geomorphic Overview of the Northern Region



Compiled and edited by John A. Nesser, Gary L. Ford, C. Lee Maynard,
US Forest Service, Northern Region
Intermountain Research Station
Cartographic Production by Duane F. Lund
Natural Resource Information System
This GIS product was compiled from various sources and may be
corrected, updated, modified, or replaced at any time.
For more information contact:
U.S.D.A. Forest Service, Northern Region

Map Scale: 1:3,500,000

Albers Equal Area Projection

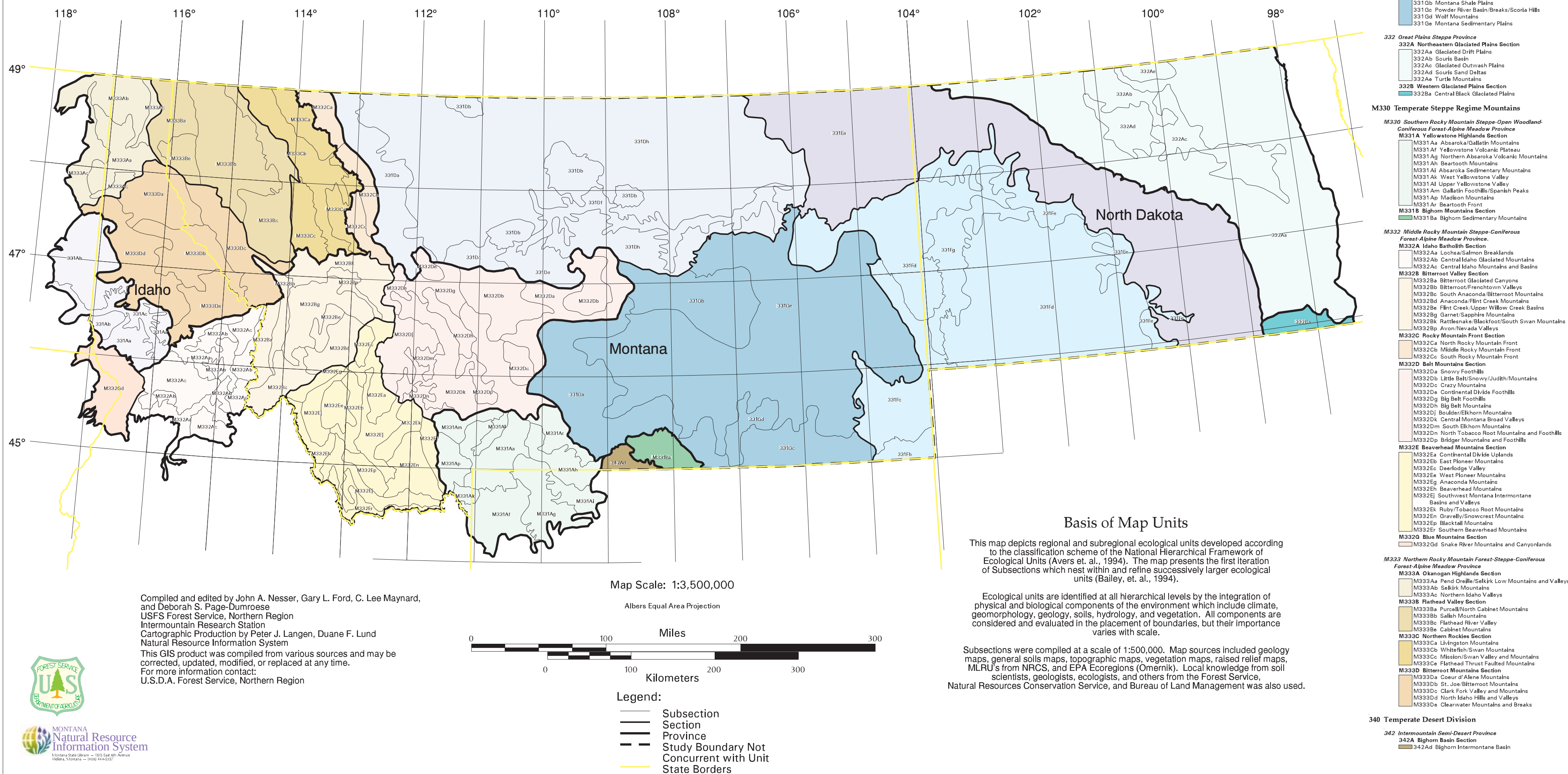


 Pryor Mountains	 Continental Glaciated Mountains
 Yellowstone Volcanic Plateau	 Metasedimentary Mountains
 Beartooth Plateau	 Columbia River Basalts
 Non Glaciated Plains	 Idaho Batholith Uplands
 Northern Glaciated Plains	 Idaho Canyon Lands
 Rocky Mountain / Beartooth Front	 Badlands and Breaks
 Central Montana Island Mountains	 Prairie Potholes
 Southwest Montana, Mountains and Valleys	 Red River Valley
 Alpine Glaciated Metasedimentary Mountains	



Ecological Units Of The Northern Region: Subsections

Montana, Northern Idaho and North Dakota First Approximation 1996



Ecological Units Of The Northern Region

Colored Relief, Sections and Subsections

Montana, Northern Idaho and North Dakota

1996: First Approximation

