United States Department of Agriculture

Forest Service

Pacific Southwest Region

In cooperation with:

U.S.D.A. Soil Conservation Service

California Department of Forestry

Regents of the University of California (Agricultural Experiment Station)

Soil Survey

Eldorado National Forest California

How To Use This Soil Survey

General Soil Map

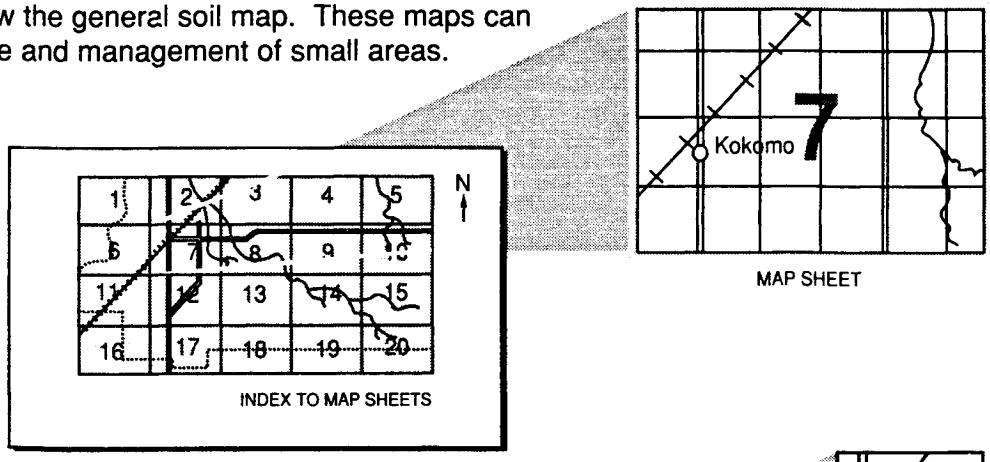
The general soil map, which is the small scale map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

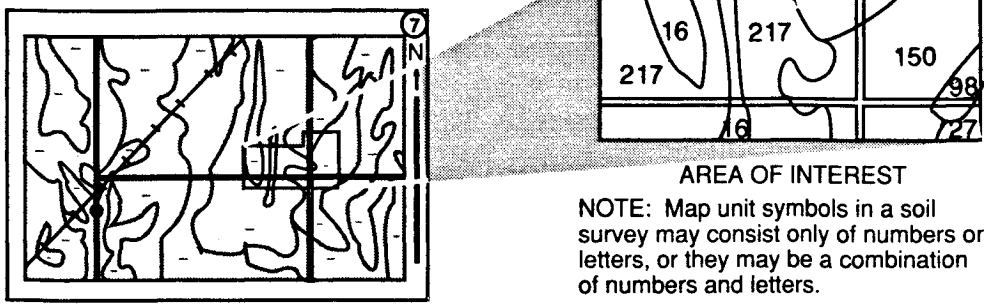
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This Soil Survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture (U.S. Forest Service and Soil Conservation Service), the California Department of Forestry (Soil-Vegetation Survey), and the Regents of the University of California (Agricultural Experiment Stations). The field work was conducted by the Forest Service and California Department of Forestry. The technical quality control for this survey was by the Forest Service. The correlation of the soils was conducted by the Soil Conservation Service in consultation with the Forest Service and the California Department of Forestry. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, martial status or age.

Major field work for this survey was performed in the period 1974-84. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to the conditions in the survey area in 1984. This survey was made cooperatively by the Forest Service, the Soil Conservation Service, and the California Department of Forestry. The survey area consists of the major portion of the Eldorado National Forest and all private land holdings within the survey boundary in Alpine, Amador, El Dorado, and Placer Counties.

Contents

Index to map units iv
Summary of tables vi
Summary of figures vii
Foreward viii
General nature of the survey area 1
History and developments 1
Geology and geomorphic history 2
Physiography, relief, and drainage 5
Climate 5
Vegetation 6
How this survey was made 12
General soil map 17
General soil map units 16
Soils of the mesic zone 16
1. Cohasset-McCarthy-Crozier 16
2. McCarthy-Ledmount 16
3. Jocal-Mariposa 19
4. Chaix-Pilliken-Holland 19
5. Rock outcrop-Maymen-Lithic Xerumbrepts 20
6. Hartless-Neuns-Mieruf 20
Soils of the frigid zone 20
7. Waca-Windy 21
8. Ledford-Notned-Lumberly 21
9. Tallac-Gerle-Xerumbrepts 21
Soils of the cryic zone 22
10. Rock outcrop-Cryumbrepts 22
11.Lithic Cryumbrepts-Andic Cryumbrepts 22
Detailed soil map units 24
Map unit descriptions and management interpretations 28
Use and management of the soils 157
Woodland management and productivity . 157
Soil manageability 157
Forest survey site class 158
Equipment limitations 159
Seedling mortality 159
Susceptibility to damage 160
Maximum erosion hazard 160
Recreation 161
Camp areas 161
Picnic areas 161
Playgrounds 161
Paths and trails 161
Construction Materials 161
Roadfill, sand, gravel, topsoil 161
Soil properties 162
Engineering index properties 163
Physical and Chemical Properties 163
Soil and water features 165
Classification of the soils 167
Soil series and their morphology 167
Formation of the soils 168
Relief 168
Patent material 168
Climate 169
Biological Activity 169
Time 169
Morphology of the soils 170
Soil Series 171
Glossary 213
Tables
Appendix

Soil Series

Aiken series 171
Andic Cryumbrepts 172
Aquepts 173
Bighill series 174
Chaix series 175
Cohasset series 176
Crozier series 177
Cryumbrepts 178
Dome series 179
Dome Variant 180
Fluvents 182
Gerle series 183
Hangtown series 184
Hartless series 185
Hartless Variant 186
Holland series 187
Jocal series 188
Ledford series 189
Ledmount series 190
Lithic Cryumbrepts 191
Lithic Xerumbrepts 192
Lumberly series 193

Mariposa series 194
Maymen series 195
McCarthy series 196
Mieruf series 197
Musick series 198
Neuns series 199
Notned series 200
Orthents 201
Pilliken series 202
Sites series 203
Smokey series 204
Tallac series 205
Tallac Variant 206
Tinker series 207
Umbrepts 208
Waca series 209
Windy series 210
Xerumbrepts 211
Zeibright series 212

Index to Detailed Soil Map Units

101 : Aiken-Cohasset loams, 2 to 30 percent slopes 28
102 : Andic Cryumbrepts-Lithic Cryumbrepts association, 15 to 50 percent slopes 29
103 : Aquepts and Umbrepts, 0 to 15 percent slopes 30
104 : Bighill-Musick complex, 50 to 75 percent slopes 31
105 : Bighill-Rock outcrop-Dome complex, 5 to 30 percent slopes 32
106 : Chaix coarse sandy loam, 30 to 75 percent slopes 33
107 : Chaix-Pilliken coarse sandy loams, 5 to 30 percent slopes 34
108 : Chaix-Pilliken coarse sandy loams, 30 to 75 percent slopes 35
109 : Chaix-Rock outcrop complex, 30 to 75 percent slopes 36
110 : Cohasset loam, 2 to 30 percent slopes 37
111 : Cohasset-Hartless Variant complex, 2 to 30 percent slopes 38
112 : Cohasset-McCarthy association, 2 to 30 percent slopes 39
113 : Cohasset-McCarthy association, 30 to 50 percent slopes 40
114 : Cohasset-McCarthy association, rhyolitic substratum, 5 to 30 percent slopes 41
115 : Cohasset-McCarthy association, rhyolitic substratum, 30 to 75 percent slopes 42
116 : Crozier-Cohasset loams, 5 to 30 percent slopes 43
117 : Crozier-Cohasset loams, 30 to 50 percent slopes 44
118 : Crozier-McCarthy complex, 5 to 30 percent slopes 45
119 : Crozier-McCarthy complex, 30 to 50 percent slopes 46
120 : Cryumbrepts association, 5 to 50 percent slopes 47
121 : Dome coarse sandy loam, 2 to 30 percent slopes 48
122 : Dome-Zeibright complex, 2 to 30 percent slopes 49
123 : Dome-Zeibright complex, 30 to 50 percent slopes 50
124 : Dome Variant coarse sandy loam, 0 to 10 percent slopes 51
125 : Fluvents, 0 to 10 percent slopes 52
126 : Gerle coarse sandy loam, 2 to 30 percent slopes 53
127 : Gerle-Notned complex, 2 to 30 percent slopes 54
128 : Gerle-Tallac complex, 5 to 30 percent slopes 55
129 : Gerle-Tallac complex, 30 to 50 percent slopes 56
130 : Gerle-Umbrepts association, 2 to 15 percent slopes 57
131 : Hangtown-Lithic Xerumbrepts complex, 15 to 50 percent slopes 58
132 : Hangtown-Smokey complex, 5 to 30 percent slopes 59
133 : Hangtown-Smokey complex, 30 to 50 percent slopes 60
134 : Hartless very gravelly loam, 5 to 30 percent slopes 61
135 : Hartless very gravelly loam, 30 to 50 percent slopes 62
136 : Hartless-Mieruf very gravelly loams, 5 to 30 percent slopes 63
137 : Hartless-Mieruf very gravelly loams, 30 to 50 percent slopes 64
138 : Hartless-Mieruf very gravelly loams, 50 to 75 percent slopes 65
139 : Hartless-Neuns complex, 15 to 30 percent slopes 66
140 : Hartless-Neuns complex, 30 to 75 percent slopes 67

141 : Hartless Variant very gravelly sandy loam, 30 to 50 percent slopes 68
142 : Holland loam, 5 to 30 percent slopes 69
143 : Holland loam, 30 to 50 percent slopes 70
144 : Holland-Bighill complex, 5 to 30 percent slopes 71
145 : Holland-Bighill complex, 30 to 75 percent slopes 72
146 : Holland-Musick loams, 5 to 30 percent slopes 73
147 : Holland-Musick loams, 30 to 50 percent slopes 74
148 : Holland-Pilliken association, 5 to 30 percent slopes 75
149 : Holland-Pilliken association, 30 to 50 percent slopes 76
150 : Jocal loam, 5 to 30 percent slopes 77
151 : Jocal loam, 30 to 50 percent slopes 78
152 : Jocal-Hartless complex, 5 to 30 percent slopes 79
153 : Jocal-Hartless complex, 30 to 50 percent slopes 80
154 : Jocal-Mariposa-Umbrepts association, 30 to 75 percent slopes 81
155 : Jocal-Sites loams, 5 to 30 percent slopes 83
156 : Ledford sandy loam, 15 to 50 percent slopes 84
157 : Ledford-Notned complex, 5 to 30 percent slopes 85
158 : Ledford-Notned complex, 30 to 50 percent slopes 86
159 : Ledmount-Rock outcrop association, 2 to 30 percent slopes 87
160 : Ledmount-Rock outcrop association, 30 to 75 percent slopes 88
161 : Lithic Cryumbrepts, 15 to 75 percent slopes 89
162 : Lithic Cryumbrepts-Waca association, 5 to 30 percent slopes 90
163 : Lithic Cryumbrepts-Waca association, 30 to 50 percent slopes 91
164 : Lithic Xerumbrepts-Rock outcrop complex, 15 to 75 percent slopes 92
165 : Lumberly gravelly coarse sandy loam, 5 to 30 percent slopes 93
166 : Lumberly gravelly coarse sandy loam, 30 to 50 percent slopes 94
167 : Mariposa gravelly silt loam, 5 to 30 percent slopes 95
168 : Mariposa gravelly silt loam, 30 to 50 percent slopes 96
169 : Mariposa-Jocal complex, 5 to 30 percent slopes 97
170 : Mariposa-Jocal complex, 30 to 75 percent slopes 98
171 : Mariposa-May men complex, 5 to 30 percent slopes 99
172 : Mariposa-Maymen complex, 30 to 75 percent slopes 100
173 : Maymen-Rock outcrop association, 30 to 75 percent slopes 101
174 : Maymen-Rock outcrop association, 75 to 100 percent slopes 102
175 : McCarthy gravelly sandy loam, 2 to 30 percent slopes 103
176 : McCarthy gravelly sandy loam, 30 to 50 percent slopes 104
177 : McCarthy-Ledmount association, 2 to 30 percent slopes 105
178 : McCarthy-Ledmount association, 30 to 75 percent slopes 106
179 : McCarthy-Rock outcrop complex, 15 to 75 percent slopes 107
180 : Mieruf very gravelly loam, 5 to 30 percent slopes 108
181 : Mieruf very gravelly loam, 30 to 50 percent slopes 109
182 : Neuns gravelly loam, 15 to 30 percent slopes 110
183 : Neuns gravelly loam, 30 to 50 percent slopes 111
184 : Neuns gravelly loam, 50 to 75 percent slopes 112
185 : Neuns-Lithic Xerumbrepts-Rock outcrop association, 50 to 100 percent slopes 113
186 : Neuns-Mieruf complex, 30 to 50 percent slopes 114
187 : Notned-Gerle complex, 30 to 50 percent slopes 115
188 : Notned-Ledford association, 5 to 30 percent slopes 116
189 : Notned-Ledford association, 30 to 50 percent slopes 117
190 : Notned-Rock outcrop association, 5 to 50 percent slopes 118
191 : Orthents-Rock outcrop association, 10 to 40 percent slopes 119
192 : Pilliken coarse sandy loam, 5 to 30 percent slopes 120
193 : Pilliken coarse sandy loam, 30 to 50 percent slopes 121
194 : Pilliken-Rock outcrop complex, 5 to 30 percent slopes 122
195 : Pilliken-Rock outcrop complex, 30 to 50 percent slopes 123
196 : Pits, borrow 124

197 : Riverwash 125
198 : Rock outcrop 126
199 : Rock outcrop-Cryumbrepts association, 15 to 75 percent slopes 127
200 : Rock outcrop-Tinker association, 15 to 75 percent slopes 128
201 : Tallac very cobbly sandy loam, 2 to 30 percent slopes 129
202 : Tallac very cobbly sandy loam, 15 to 30 percent slopes, stony 130
203 : Tallac-Cryumbrepts, wet association, 15 to 30 percent slopes 131
204 : Tallac Variant-Lithic Xerumbrepts-Rock outcrop complex, 15 to 50 percent slopes 132
205 : Tinker very cobbly coarse sandy loam, 30 to 75 percent slopes 133
206 : Tinker-Cryumbrepts, wet-Rock outcrop association, 2 to 30 percent slopes 134
207 : Tinker-Tallac complex, 50 to 75 percent slopes 135
208 : Tinker-Tallac-Rock outcrop association, 5 to 30 percent slopes 136
209 : Tinker-Tallac-Rock outcrop association, 30 to 75 percent slopes 138
210 : Umbrepts-Tallac-Gerle association, 15 to 30 percent slopes 140
211 : Waca cobbly sandy loam, 5 to 30 percent slopes 142
212 : Waca cobbly sandy loam, 30 to 50 percent slopes 143
213 : Waca-Lithic Cryumbrepts association, 30 to 50 percent slopes 144
214 : Waca-Lithic Cryumbrepts-Cryumbrepts, wet association, 5 to 30 percent slopes 145
215 : Waca-Lithic Cryumbrepts-Cryumbrepts, wet association, 30 to 50 percent slopes 146
216 : Waca-Windy complex, 5 to 30 percent slopes 148
217 : Waca-Windy complex, 30 to 50 percent slopes 149
W : Water
218 : Windy gravelly sandy loam, 5 to 30 percent slopes 150
219 : Windy gravelly sandy loam, 30 to 50 percent slopes 151
220 : Xerumbrepts-Cryumbrepts, wet association, 5 to 50 percent slopes 152
221 : Zeibright extremely gravelly coarse sandy loam, 2 to 30 percent slopes 153
222 : Zeibright extemely gravelly coarse sandy loam, 30 to 75 percent slopes 154
223 : Zeibright gravelly sandy loam, 15 to 50 percent slopes 155
224 : Zeibright-Rock outcrop association, 15 to 75 percent slopes 156

Summary of Tables

Acreage and proportional extent of the soils (Table 1) 26
Acres. Percent.
Woodland management and productivity (Table 2) Tables-1
Soil manageability. Forest survey site class. Equipment limitations. Seedling mortality.
Susceptibility to damage from-Fire, Compaction, Puddling, Soil displacement.
Revegetation exposed subsoil. Maximum erosion hazard.
Recreational development (Table 3) Tables-15
Camp areas. Pinic areas. Playgrounds. Paths and trails.
Construction materials (Table 4) Tables-32
Roadfill. Sand. Gravel. Topsoil.
Engineering properties and classifications (Table 5) Tables-51
Depth. USDA texture. Classification-Unified, AASHTO,. Fragments greater than 3 inches.
Percentage passing sieve number-4, 10, 40, 200. Liquid limit. Plastic index.
Physical and chemical properties of soils (Table 6) Tables-75
Depth. Permeability. Available water capacity. Soil reaction. Shrink-swell potential.
Erosion factors-K,T.
Soil and water features (Table 7) Tables-87
Hydrologic group. Flooding-Frequency, Duration, Months. High water table-Depth, Kind,
Months. Bedrock-Depth, Hardness. Cemented pan-Depth, Hardness.
Risk of corrosion-Uncoated steel, Concrete.
Classification of the soils (Table 8) Tables-95
Chemical data for selected soils (Table 9) Tables-97
ExtracTable bases. Cation exchange capacity. Base saturation. Organic matter. C/N. pH.

Phosphorus. Fe as Fe_2O_3.
Physical data for selected soils (Table 10) Tables-99
Particle size distribution-sand, silt, clay. Moisture retained-1/3 ATM., 15 ATM., air dry, available 1/3 to 15 ATM.

Summary of Figures

General geology (Figure 1) 3
Average Number of Days in Growing Season (Figure 2) 7
Mean Annual Precipitation (Figure 3) 9
Areas of Mapping Intensity (Figure 4) 13
General Soil Map (Figure 5) 17

Foreword

The Soil Survey of Eldorado National Forest Area, California, in parts of Alpine, Amador, El Dorado and Placer Counties, was designed to facilitate forestwide resource management planning and to increase the knowledge of our environment. It contains predictions of soil behavior for selected land uses. It also points out inherent limitations or hazards to land uses.

This soil survey has been prepared primarily for forest resource planners and managers. It is useful for prelimary project planning, for identifying general soil management considerations, and for evaluation of more intensive soil survey needs. The survey could be used for detailed resource management and project level planning with field verification.

Major differences in soil properties can occur even within short distances. Some soils are shallow to bedrock and have low available water capacity.
These conditions inhibit plant growth. Some soils are seasonally wet and have a high water table or are subject to flooding.

Soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each detailed soil map unit is shown on detailed soil maps. Each kind of soil in the survey area is described and information is given about each soil for specific uses.

This soil survey can be useful in the conservation, improvement, and productive use of soil, water, and other resources.

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Soil Survey of Eldorado National Forest Area, California

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General Nature of the Survey Area

This section describes the physiography, relief, and drainage, the geology, and the geomorphic history of the survey area. It also gives some important facts about the history and development, climate and vegetation of the survey area.

History and Developments

This section was prepared by Dana E. Supernowicz, United States Forest Service Historian, Eldorado National Forest.

At the time of European contact, the native peoples living within the survey area belonged to the Southern Maidu or Nisenan, Northern Sierra Miwok, and Washo language groups. The subsistence patterns of these native peoples were related to the annual harvesting of acorns and pine nuts, while hunting and fishing took place year around. Archaeological and botanical evidence suggests native peoples practiced forms of "burning" to reduce the chapparal and brush, encourage new production and drive game into nets or area where they could be easily killed. Their territory encompassed the entire present-day boundaries of the Eldorado National Forest.

Neither the Spanish nor the Mexican governments undertook a thorough exploration of the Mother Lode region or the mountains of the Sierra. Spanish expeditions into the Central Valley during the 1770's, such as the expedition of Captain Pedro Pages and Fray Juan Crespi, only caught a glimpse of the Sierra Nevada. During the nineteenth century Anglo-Americans attempted to cross the Sierra. In 1826 Jedediah Smith made the first west to east crossing and in 1844, John Fremont and Christopher "Kit" Carson crossed from east to west near the present-day Carson Pass.

In 1848 a group of Mormons, having been present at the site where gold was discovered, mined for gold for a short time after the discovery, but soon felt a need to return to Salt Lake City. Hearing negative accounts of the Truckee Route, they were determined to locate a new and hopefully safer route over the Sierra. Following the present-day Iron Mt. Ridge the entire party arrived at a spring, which they named "Tragedy" after discovering the mutilated bodies of the three scouts Browett, Allen, and Cox. The route established by the Mormon Battalion lead to the development of the trail as a major wagon road between 1849-1854.

Although explorers reached the present-day Eldorado National Forest during the 1820's, significant development of the forest environment did not occur until thirty years later. The Eldorado National Forest, located in the Central Sierra and the heart of the Mother Lode, was the nucleus for rapid and unprecedented population expansion. From the onset of the Gold Rush the lands encompassing the Forest have sustained a multitude of people of varying nationalities and occupations. During the early 1850's El Dorado County boasted one of the largest populations in the State.

Several years after the discovery of gold at Sutter's Mill, food production developed as a secondary industry. The development of ranches and the cultivation of orchards

helped sustain the growing population of the Mother Lode during the 1850's. In 1856 the *Sacramento Union* reported that William Tanner proposed to plant an extensive fruit orchard near Weberville. The range in which fruit can be grown in the central Sierra is limited to lower elevations, since orchards above 4,000 feet are subject to heavy snows and frosts that destroy the fruit and kill the trees. Certain soils were more compatible with fruit production. The Camino, Mosquito, Coloma, Gold Hill, Missouri Flat, Placerville, Pleasant Valley, and Fairplay areas contain deep residual soils that were productive under cultivation. By the 1860's cultivation, logging, and the introduction of new crops and grasses had modified the surrrounding environment in the Sierra foothills. Forests as low as Shingle Springs were cleared out in the 1850's and later became open fields and oak-grassland environments. At the higher elevations dairies were established, supplying milk, butter and cheeses to the mining camps.

The location, type, and complexity of camps, towns, and activities were greatly influenced by both the physical and climatic environment within the study area. The forested mountain area of El Dorado, Amador, Placer, and Alpine counties provided an abundance of cheap forest products and food, while the topography of the four counties determined the types and diversity of minerals available for exploitation.

Taking advantage of these conditions, miners, agriculturalists, and merchants settled the foothills and forests, which were previously inhabited by native peoples. Mining communities dependent upon mineral resources were unstable as a direct result of the availability of these resources. However, mining boom towns, such as Placerville, survived and prospered during the mining decline of the mid-1850's, because of the camp's central location linked to a regional and nationwide wagon road network. Other communties not so fortunate drastically declined in population after 1860, such as Grizzly Flats, Volcanoville, Weberville, Cedarville, as well as hundreds of other mining camps, some of which only lasted several years.

Throughout the late nineteenth century land speculators purchased immense tracts of land throughout the eastern and western slopes of the Sierra Nevada. Many hoped to acquire large blocks of land adjacent to the railroad land grants, which formed an unmistakable checkerboard pattern in El Dorado, Placer, and Nevada counties. Both timber and mineral exploitation occurred within these blocks; however, timber provided the bulk of the products shipped out of the study area, as well as the largest revenue distributed to the counties after 1900. Two timber companys operated logging railroads; the Michigan-California lumber Company out of Camino and the California Door Company at Caldor and later Diamond Springs.

The massive depletion of timber resources in the West during the late nineteenth century persuaded the United States Congress to pass legislation aimed at reducing the wasteful practice of timber exploitation. In March 1885 California created a forest board to demonstrate through education and research the proper methods of managing timber resources. Six years later the Forest Reserve Act was passed authorizing the President to set aside forest reserves from the public domain. In 1894 the Stanislaus Forest Reserve was established, followed by the Lake Tahoe Forest Reserve in 1899. In 1905 the Stanislaus Forest Reserve transfered a portion of its land to Yosemite National Park, and the Lake Tahoe Forest Reserve redescribed its boundary and changed its name to the Tahoe Forest Reserve. Two years later the forest reserves were changed to "national forests." With additional lands added to the Tahoe and Stanislaus National Forests after 1907, the management of both forests became difficult due to their extended size. On July 28, 1910, to help minimize the problem, President Taft established the Eldorado National Forest from portions of the Tahoe and Stanislaus National Forests.

Between 1910 and 1940 a number of significant bills were authorized, many of which dealth with land acquisition and exchange, reforestation, grazing, and emergency conservation work. The effects of such legislation was monumental. The key to the management of the national forest was regulating the uses which occurred within the forest. The goals and mission of the Forest Service had an unprecedented impact on the people living in or familar with the forested regions of California.

Geology and Geomorphic History

The following summary of the geologic and geomorphic history can be helpful in understanding the relationship between parent materials and relief in the survey area. Figure 1 illustrates the typical geology of the survey area.

The Eldorado National Forest Area is in the Sierra Nevada geomorphic province and lies on the western slope of the Sierra Nevada range. Early in geologic time, in the late Paleozoic period, the area was covered by a vast inland sea in which large amounts of several kinds of sediment were deposited. The sediment of this sea was uplifted, and intense folding and metamorphism followed. As a result the Shoo Fly Complex (S2), a nearly continuous belts of vertically tilted undifferentiated metamorphic rock, was formed with ridges extending generally to the northwest. The fine grained sedimentary rock was changed to slate; siliceous sediment,

Location of the Eldorado National Forest Area, California

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to quartzites and metacherts; volcanic rock, to amphibolite schists and greenstone; and calcareous ooze, to crystalline limestone. Isolated bodies of early to middle Jurassic age metavolcanic, metasedimentary, and sparse carbonate rock occur in the eastern portion of the survey area as roof pendants (S3). These rocks lie with angular unconformity over the Shoo Fly Complex to the west and are generally surrounded by the granitic batholith to the east.

Then the Area was intruded by ultrabasic rock, most of which was altered to serpentine. Soon there after a sequence of granitic-type rocks was emplaced on a major scale, beginning with the more basic gabbrodiorite and followed by the more acid granodiorite. At that time slopes in the Area were alined more gently westward than they are today. The crest of the Sierra Nevada, however, was approximately in its present location. Then the surface of the folded sedimentary and volvanic rock was lowered throughout by a long period of erosion, and large areas of the granitic batholith (S1) became exposed.

The volcanic activity began in the Sierra Nevada in the late Eocene period. Rhyolitic ash fell at the lower elevations and at the higher elevations; both flows and ash falls were deposited. These ash falls and flows formed the Valley Springs formation. This formation choked the stream channels, and the drainage system was completely changed. After the rhyolithic emissions, the volcanoes began to discharge andesitic material, mostly mud flows, dust, and lava flows. These flows formed the Mehrten formation (S4), a andesetic lahar, that again choked the streams, and new drainage ways formed. The geologic activity of this time marked the beginning of the present land forms and had a strong influence in forming the soil patterns in the Area.

In Pleistocene times, a major uplift of the Sierra Nevada Range was caused by faulting along the Range's east flank. The western slope was uniformly tilted upwards. Then the west-flowing rivers and streams in the newly uplifted area removed much of the volcanic debris and cut deep canyons into the underlying materials, leaving long, tabular, volcanic ridges and exposures of tertiary river gravel, rhyolitic tuff, and granitic and metamorphic rock. From the crest down to 4,800 feet glaciation was also taking place. Large areas of glaciated granitic rock were exposed, sculpturing the present day crest zone. Glacial till and outwash material was deposited in basins and along drainages on the western edge of the crest glaciation.

Physiography, Relief, and Drainage

The Eldorado National Forest Area is in the western part of the central Sierra Nevada. The survey area is dominated by a glacially sculptured granitic crest zone, gently sloping volcanic ridges at the mid-elevations, and steeply dipping, faulted and folded metamorphic rocks on the western edge. Overlying the bedrock in many places are mantles of river gravels, glacial deposits, and volcanic debris.

The ascent from the Central Valley is gently sloping, and the average slope through a west-to-east transect is about 5 percent. In general, the trends of the ridges and rock formations is northwest by southeast. Drainage is generally toward the southwest, and the drainage channels have cut through geologic formations and followed the westward tilting of the Sierra fault block. The headwaters of the major drainages start in the glaciated crest zone and descend though the gently sloping volcanic and granitics to the deeply entrenched V-shaped metamorphic canyons on the western edge of the survey area. Typically, landforms in the folded and faulted areas of metamorphic rocks are steep and angular, in the granitics they are rounded and smooth with a basin-like appearance, and in the volcanic areas they are flat topped and smooth.

The survey area is drained mainly by the Middle and South Forks of the American River, the Consumnes River, and the Mokelumne River. There are many major perennial streams in these drainage areas.

Climate

The survey area is characterized by a Mediterranean climate with abundant sunshine in summer, moderate to heavy precipitation in winter, and a wide temperature range. The area is subject to strong flows of marine air from the Pacific Ocean in winter, which results in heavy precipitation particularly at intermediate elevations in the mountains. At high elevations much of the precipitation falls as snow, providing a water supply that lasts into summer. Precipitation in summer is light and generally is limited to a few scattered thunder showers.

The Sierra Nevada range plays a dominant role in determing the climate in the survey area. Differences in elevation affect both temperature and precipitation on the western slopes of the mountains. Precipitation

tends to increase with elevation and temperature decreases with elevation, except that some of the valleys are cooler than the slopes above them at night because of cold-air drainage.

The average annual temperature in the survey area ranges from above 55° F at the lower elevations to about 39° F near the crest. The average minimum temperatures in January decrease from about 32° F at the lower elevations to about 16° F at the higher elevations. Minimum temperatures are affected by local differences in the terrain. Average maximum temperatures in July range from about 72° F at the higher elevations to nearly 88° F at the lower elevations.

The growing season, which is the interval between the last temperature of 32° or lower in spring and first in fall, ranges from 50 to 175 days. The average date of the last freezing temperature in spring is about the 1st of May at the lower elevations and about the last of June at the higher elevation. In fall the average date of the first freezing temperatures ranges from the early part of August in the cooler parts of the survey area to the first of November in the warmer part. The average length of the growing season is shown in Figure 2.

Mean annual precipitation ranges from 40 to 70 inches with the majority of it falling between November and April. Figure 3 shows the mean annual precipitation for the survey area.

Vegetation

The CALVEG (7) classification system is used to describe the vegetation. The following list describes the CALVEG series found in the survey area.

Conifer Forest/Woodland

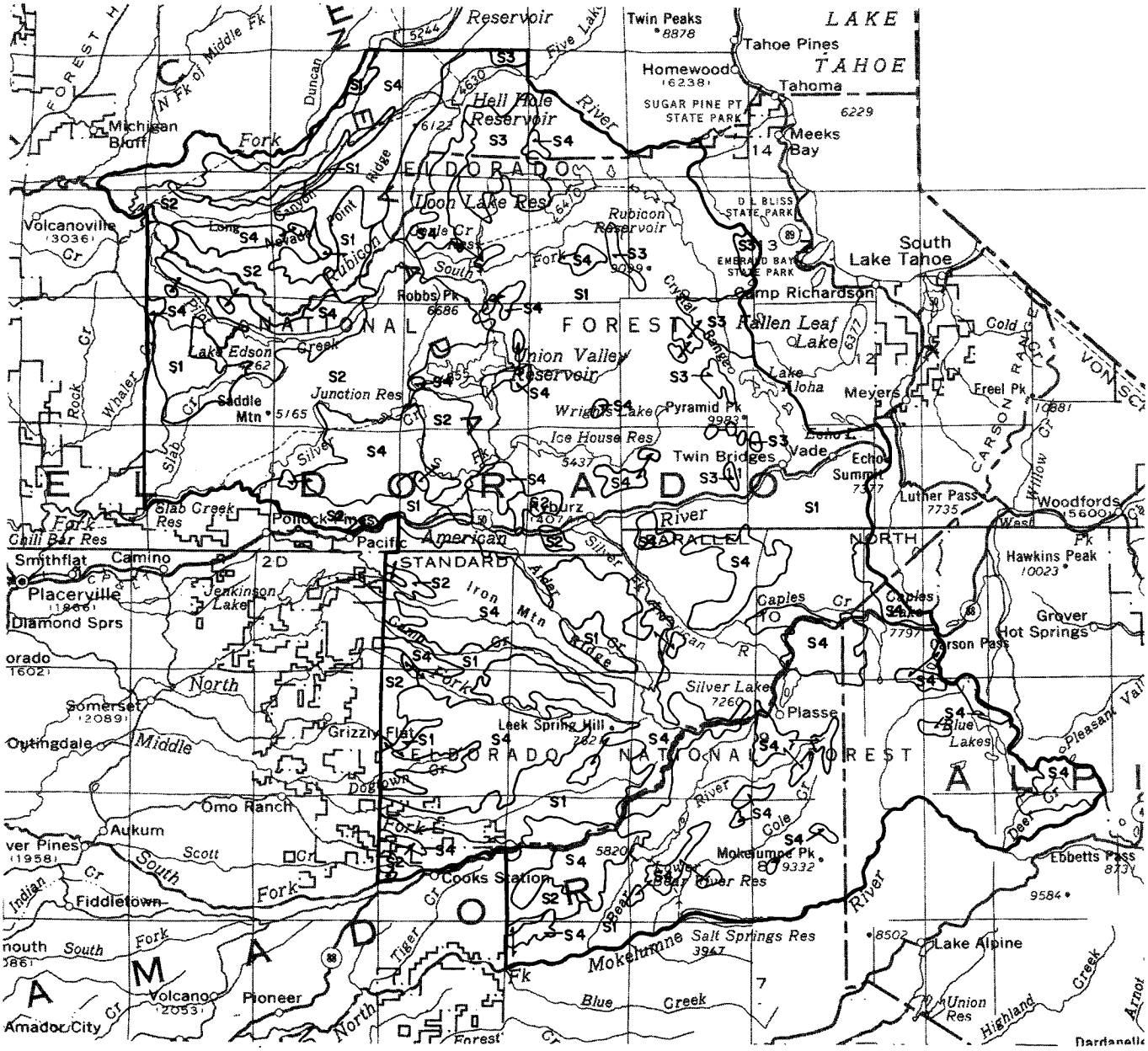
Mixed Conifer-Fir series. This is the high elevation counterpart of the Mixed Conifer-Pine series. Within the elevational range of 4,800 to 7,500 feet, on frigid soils, the major species include white fir (*Abies concolor*), red fir (*Abies magnifica*), sugar pine (*Pinus lambertiana*), and Jeffrey pine (*Pinus jeffreyi*). The lower elevations within this range are primarily dominated by white fir and Jeffrey pine. In the higher elevations red fir becomes more dominant, however Jeffrey pine and white fir will continue to occur in decreasing amounts. Greenleaf manzanita (*Arctostaphylos patula*), huckleberry oak (*Quercus vaccinifolia*), and mountain whitethorn (*Ceanothus cordulatus*) are the associated understory shrubs.

Red Fir series. This series generally occurs as dense, pure stands or as an inclusion in the Mixed Conifer-Fir series. This series is found from about 5,600 feet to 10,000 feet on frigid soils. In dense red fir stands with heavy litter accumulation, understory plants do not occur except for *Pipsissewa* and wintergreen (*Chimaphila menziesii* and *Pyrola picta*). In more open stands or where red fir intergrades with Mixed Conifer-Fir, mountain whitethorn, pinemat manzanita (*Arctostaphylos* nevadensis), and greenleaf manzanita are the dominant understory shrubs. Western white pine (*P. monticola*) and lodgepole pine (*P. contorta var. murrayana*) are associated conifer species. Mountain hemlock (*Tsuga mertensiana*) may occur as isolated trees in colder areas of the red fir series.

Mountain Hemlock series. Mountain hemlock (*Tsuga mertensiana*) the dominant of this series, is representative of cryic areas. It is generally found on north or east facing slopes where snow accumulation holds well into the summer months. It occurs as a dominant species in cold swales from 6,400 feet to 8,800 feet, and in almost pure open stands on ridgetops above 8,500 feet with western white pine (*Pinus monticola*). In moist areas willows (*Salix spp.*) and mountain alder (*Alnus tenuifolia*) are associated understory species.

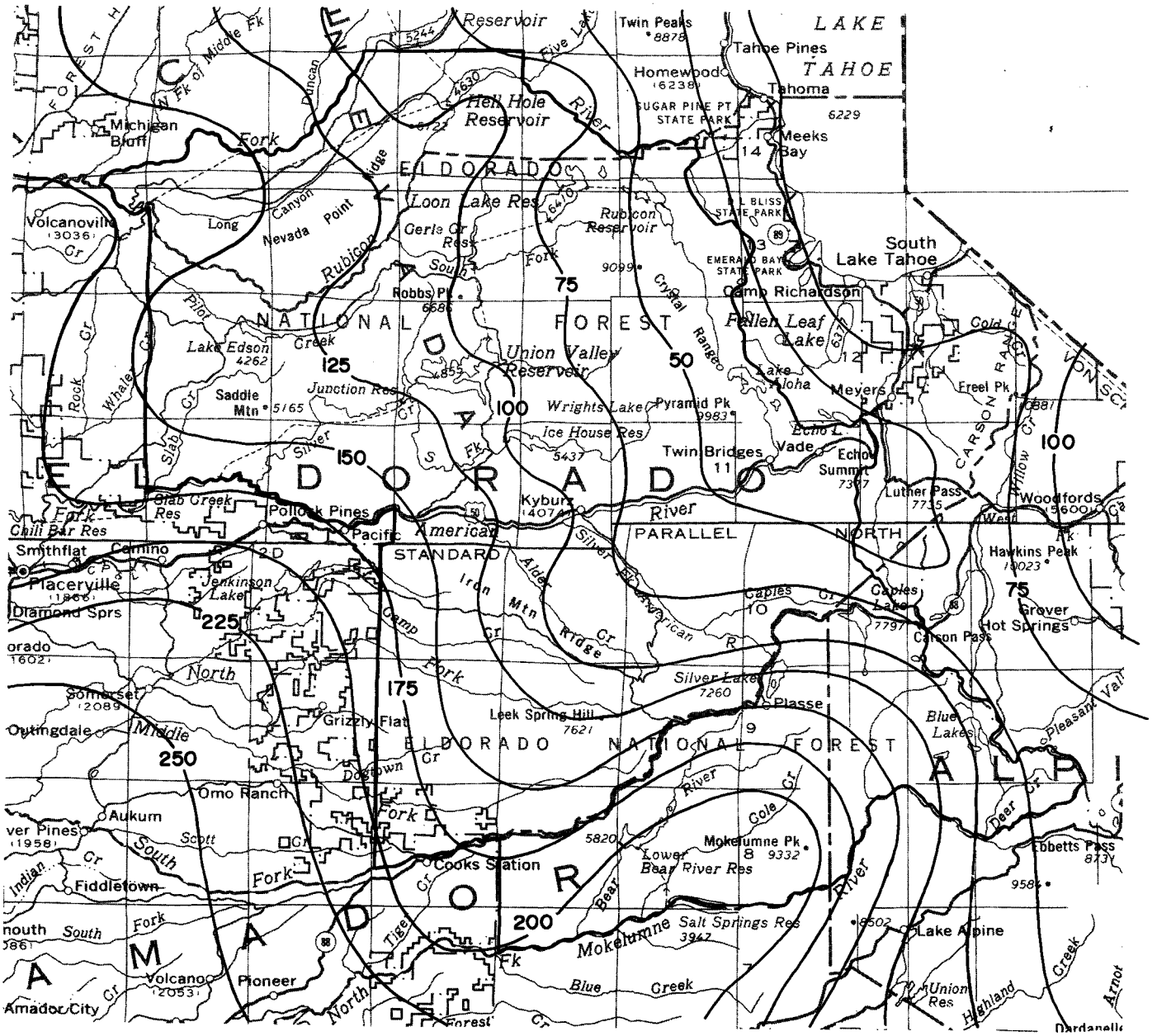
Lodgepole Pine series. This series occurs intermingled with the Red Fir Series and the Mixed Conifer-Fir series at elevations from 5,000 feet to 9,000 feet or on cryic soils above 9,000 feet. Lodgepole pine (*Pinus contorta var. murrayana*) is found either in dense, pure stands in swales with abundant year around moisture or as scattered individual trees on very dry soils. Lodgepole is an invader species and as the microsite changes, it may be replaced by red fir, Jeffrey pine or white fir. In the periphery of meadows, as the water table level drops, lodgepole will replace the sedge and forb species. The occurence of lodgepole generally indicates environmental conditions outside the establishment and growth requirements of white fir, red fir or jeffrey pine.

Mixed Conifer-Pine series. This series dominates the western slopes at elevations between 2,000 feet and 6,500 feet on mesic soils. Major conifer species include ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), and incense cedar (*Libocedrus decurrens*). Sugar pine (*P. lambertiana*) and white fir (*Abies concolor*) are common associates at the higher elevations. Black oak (*Quercus kelloggii*) may occur as a major component at lower elevations. These species mix freely. The pines normally dominate the south and west facing slopes, and Douglas-fir and white fir dominate the north and east slopes, with incense cedar as a secondary component of all slopes. Understory shrubs within this series include deerbrush, indian manzanita, whiteleaf manzanita, and at higher elevations greenleaf manzanita.

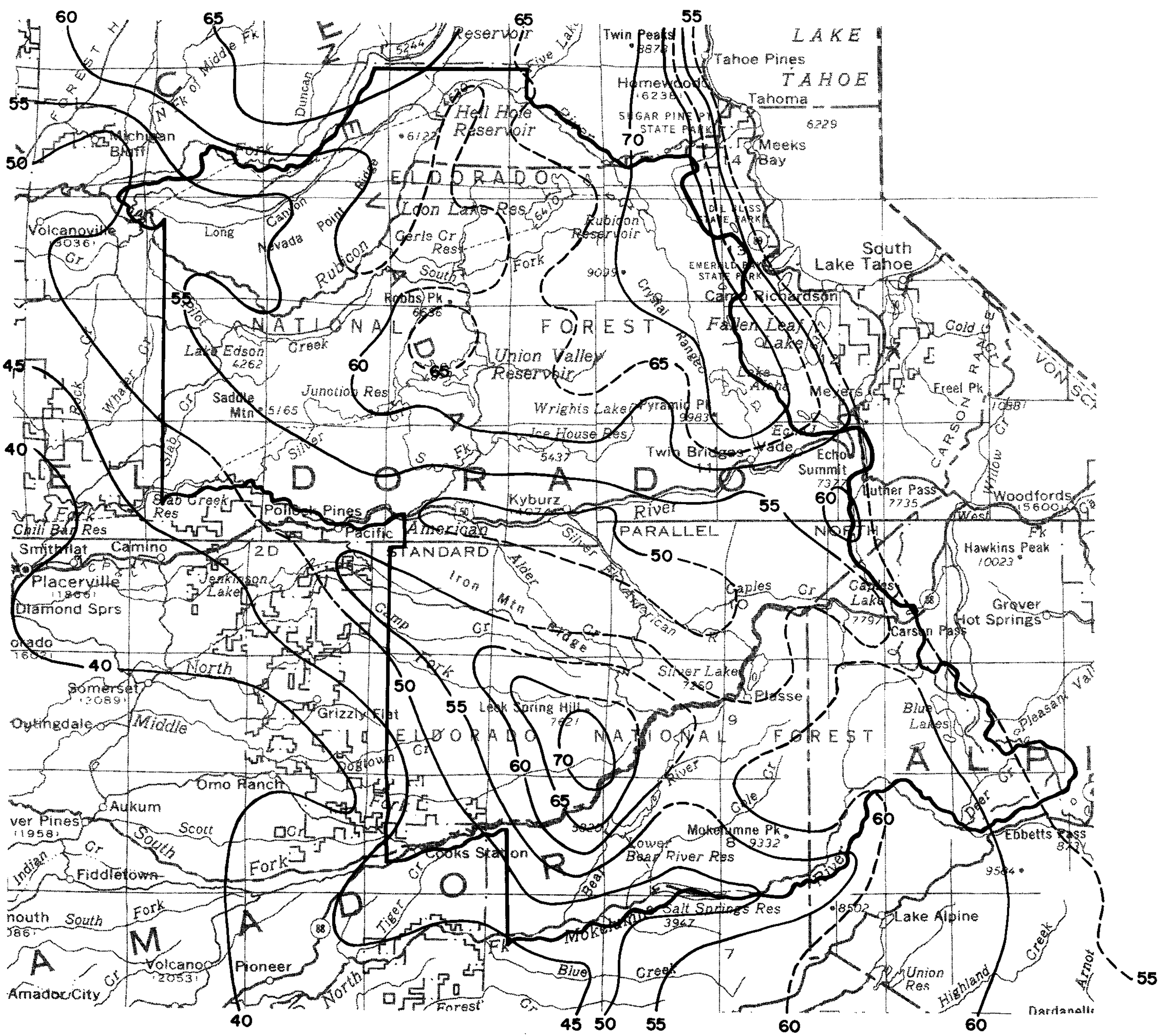


General Geology
Eldorado National Forest Area

S1 Granitic Batholith
S2 Shoo Fly Complex
S3 Roof Pendants
S4 Mehrten Formation



Average Number of Days in Growing Season
Eldorado National Forest Area



Mean Annual Precipitation
Eldorado National Forest Area

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Hardwood Forest/Woodland

Alder series. White alder (*Alnus tenuifolia*) is a dominant high elevation riparian species, generally located above 5500 feet, but it ranges from 2,000 to 7,500 feet. This series is located on stream banks and meadows adjacent to red fir and lodgepole pine. The Alder series is readily located in large perennial grass meadows where stream courses exist. Willow (*Salix spp.*) occurs as an associate.

Canyon Live Oak series. This series is dominated by canyon live oak (*Quercus chrysolepis*) and occurs on droughty sites. This series is found on shallow colluvial soils in steep canyons generally between 2,000 feet and 5,500 feet. This hardwood is occasionally associated with the Mixed Conifer-Pine and Black Oak series. Mixed shrubs (*Ceanothus integerrimus* and *Arctostaphylos viscida*) will occur in the understory, as will grasses. The tree form of California bay and digger pine (*Pinus sabiniana*) also occur as minor components.

Maple-Alder-Dogwood series. This combination of hardwoods (*Acer macrophyllum*, *Alnus rhombifolia*, and *Cornus nuttallii*) identifies a riparian series. Elevational range is from 2,000 feet to 5,000 feet on mesic soils. These hardwoods are generally located along perennial streams, seeps, and in canyon bottoms. Both maple and dogwood occur as understory species within the Mixed Conifer-Pine series. These riparian associated species also occur in stringers with manzanita and ceanothus.

Willow series. This series (*Salix spp.*) occurs in high elevation riparian areas, generally from 6,000 to 9,500 feet. This riparian series is generally located on streambanks, meadows, and moist canyon bottoms adjacent to the Red Fir and Lodgepole Pine series. The Willow series is easily found in stringers adjacent to streamcourses which meander through perennial grass meadows. White alder occurs as an associate.

Chaparral

Huckleberry Oak series. Huckleberry oak (*Quercus vaccinifolia*) occurs on shallow, xeric, and frigid soils of rocky south and west facing slopes. This series is a good indicator of poor growing sites. Elevational range is from 5,400 feet to 7,800 feet and above. Bush chinquapin, greenleaf manzanita, mountain whitethorn, and bitter cherry are the associated shrub species. Conifer species, if present, are Jeffrey pine, red fir, and western white pine.

Greenleaf Manzanita series. Greenleaf manzanita (*Arctostaphylos patula*), a stump-sprouter, occurs in pure stands and scattered throughout the Mixed Conifer-Fir series. Associated species are pinemat manzanita (*A. nevadensis*), mountain whitethorn, bitter cherry, and bush chinquapin (*Castanopsis sempervirens*). This series is found from 3,000 feet to 6,000 feet in Plumas County and below 5,000 feet in Amador County. It generally invades the frigid soils of the south and west facing Sierran slopes between 2,000 feet and 6,000 feet.

Mountain Whitethorn series. Mountain Whitethorn, sometimes referred to as Snow Bush (*Ceanothus cordulatus*), occurs on dry open flats and slopes from 2,400 feet to 8,500 feet. This series may occur in pure stands or may occur with Greenleaf Manzanita, Pinemat Manzanita, and Bitter Cherry as associates.

Herbaceous

Mule Ears series. Mule ears (*Wyethia mollis*) is typically located throughout the Red Fir and Mixed Conifer-Fir series as an understory species and dominates openings with gravelly coarse textured soils. Mule ears occasionally associates with other herbs such as rockcress (*Arabis platysperma*), violet (*Viola purpurea*), monardella (*Monardella odoratissima*), and buckwheat (*Eriogonum latifolia* ssp. *nudum*).

Sedge-Rush series. This wet meadow series occurs on level or gently sloping areas with year around moisture. It also occurs adjacent to streams, meadows, lakes, and occasionally as an understory to lodgepole pine in wet swales. Dominant species are sedges (*Carex spp.*) and rushes (*Juncus spp.*) as well as water tolerant grass and forb species.

How This Survey Was Made

This soil survey has followed the directives and guidelines in the Forest Service Manual and Handbooks. It has also followed the concepts, procedures, and guidelines of the National Cooperative Soil Survey as specified in the *Soil Survey Manual* (10), the *National Soils Handbook* (9), and the soil classification system as stated in *Soil Taxonomy* (12).

Soil Scientists began the inventory by collecting, studying, and correlating all the existing data and information concerning the survey area that is related to soil genesis and morphology. This included lithological, gemorphological, topographical and elevational, climatic, vegetative, and existing soil survey data both within and adjoining the survey area.

This data and information was assimilated and transferred to a single base map of suitable scale and accuracy forming the beginning soil map unit delineations or a schematic map. With the schematic map and aerial photo field sheets (stereo-pair coverage) in hand, the soil scientist made a reconnaissance study of the survey area. At this time, the delineations on the schematic map were checked for accuracy of content and location. The aerial photos were studied stereoscopically and the photo images were compared to the conditions found on the ground to insure that later recognition by photo interpretation would be credible. Lithologic, geomorphic, soil, and vegetative characteristics were recognized and recorded in field notes, on the schematic map, and on the aerial photo field sheets.

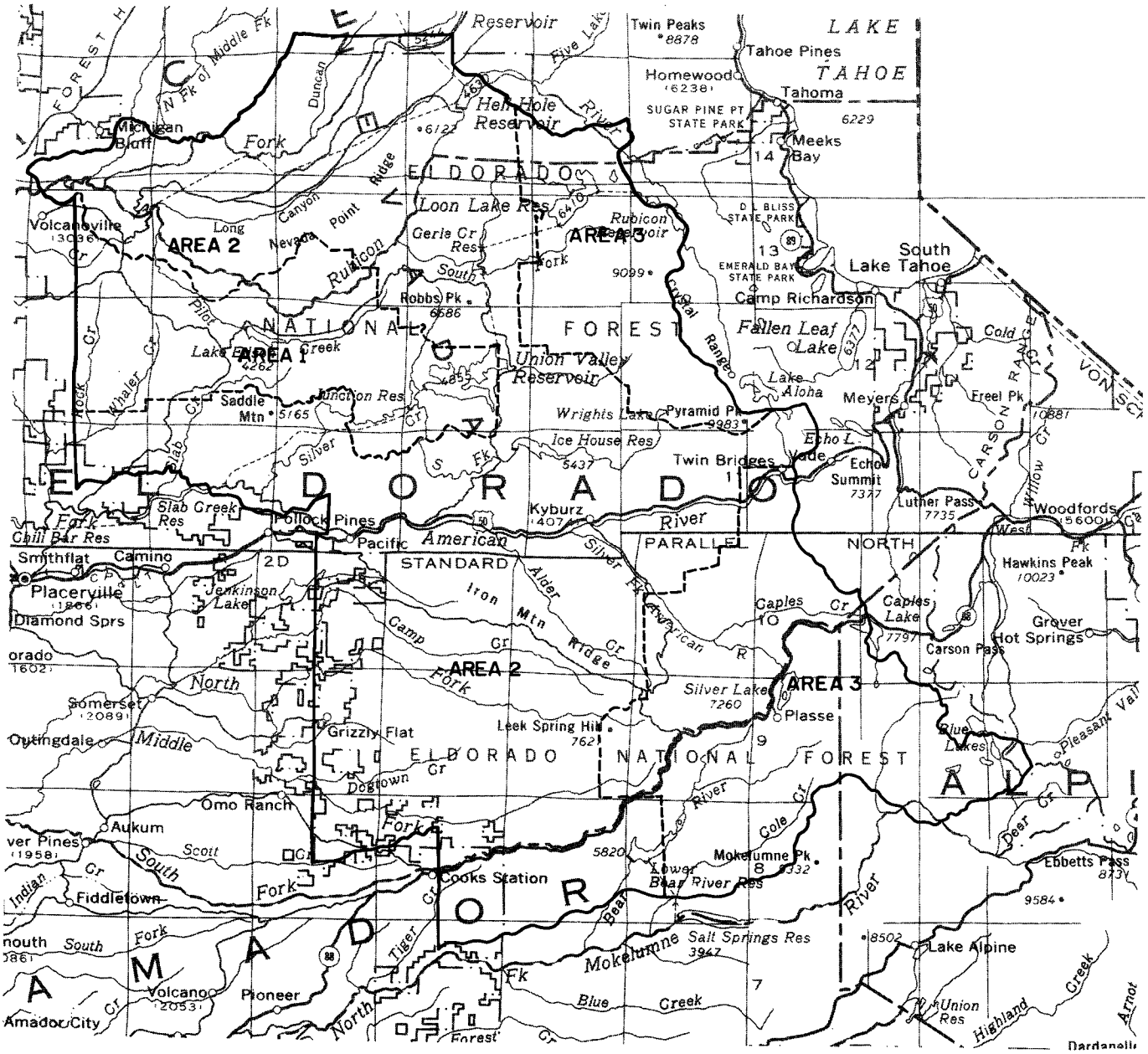
Using the augmented and corrected schematic map, field notes, and an understanding of how the photo images related to actual conditions on the ground, the soil scientist delineated map units on the aerial photographs. The map units corresponded to segments of the landscape having similar landform, vegetative cover, and soils as determined by a knowledge of ground conditions and by stereoscopic aerial photo interpretation. These aerial photos with the delineated map units and delineation symbols became the exploratory or preliminary soils map.

With the aerial photos (exploratory soils maps) and a field stereoscope in hand, the soil scientist examined on the ground as many delineations of each map unit as was possible, considering the access and time allowed to complete the survey. In this way, each different map unit was examined, studied, and described by aerial photo interpretation and on-the-ground investigation. However, in this survey area three levels of survey intensity (Orders 2, 3, 4) were used. The intensity of mapping within each of these Orders is mainly related to the degree of the on-the-ground investigation. Figure 4 shows the areas that were mapped at the different intensity levels.

In area 1 the California Department of Forestry's Soil-Vegetation Survey mapped to an Order 2 intensity level. In this area every delineation of each different map unit was visited and examined on the ground. As each map unit was visited and examined, individual soils were recognized, studied, described, classified, and enough data was collected to furnish the information needed to make interpretations and predictions concerning the use and management of each soil. The map units usually contain soils that are inseparable on a particular portion of the landscape. These areas were mapped as soil complexs. In some areas map units with individual soils were also delinated. *Maps made at this intensity level are suitable for project planning. Only minimal additional field verification may be necessary.*

In area 2 the Forest Service mapped to an Order 3 intensity level. In this area every delineation of each different map unit was not visited and examined on the ground. Those delineations with no easy access were rarely visited, but were mappped by aerial photo interpretation. Therefore, possibly one-third to one-half of the delineations on the field sheets and maps were not entered and examined by an on-the-ground investigation. *This is one of the main aspects of this survey that limits its reliability.* It is one reason that the survey is not suitable for project planning without field verification.

As each map unit was visited and examined, individual soils were recognized, studied, described, classified, and enough data was collected to furnish the information needed to make interpretations and predictions concerning the use and management of each soil. *However, the exact location of each soil was not delineated.* The map units usually consist of a group of soils that occupy a particular portion of the landscape which was delineated on the aerial photo field sheets. Depending on the area location, arrangement and extent of the individual soils that are components of the delineated map unit, a map unit is called an association or complex of soil components. The soil scientist made a field and aerial photo examination to estimate the soil component percentage composition for each map unit. These map units *do not* necessarily consist of similar soils. They consist of geographically associated soils that may be, and usually are, quite different in their characteristics and their suitability for use and management. *These are other aspects of the survey that limit its reliability and make it not suitable for project planning without field verification.*



Mapping Unit Areas
within the
Eldorado National Forest
Soil Survey Area

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In area 3 the Forest Service mapped to an Order 4 intensity level. In this area representative delineations of each map unit were identified by photo interpretation and their patterns and composition determined by transects. Subsequent delineations were mapped mostly by interpretation of remotely sensed data verified by an occasional observation and traverse. Boundaries were then plotted by air photo interpretation. As each representative map unit was visited and examined, enough data was collected to identify groups of soils that have similar types and arrangement of diagnostic horizons. Individual soils were not identified. The map units usually consisted of these individual groups of soil or an association of these groups. The soil scientist made a field examination of the representative delineations and used aerial photo interpretation to estimate the percentage composition for each map unit. These map units do not necessarily consists of similar soils. They consist of geographically associated soils that may be, and usually are quite different in their characteristics and their suitability for use and management. *Soil maps made at this intensity level are not suitable for project planning and should only be used for broad multicounty, regional, or state wide planning efforts.*

The photo base used during field mapping in Area 1 was at a scale of 1:24,000. The photo base used during field mapping in Area 2 and Area 3 was at a scale of 1:15,840. The maps published with this report are at a scale of 1:63,360. In addition, Soil-Vegetation maps at a scale of 1:24,000 are available from the California Department of Forestry for Area 1. Soil maps for Areas 2 and 3 are also available at 1:24,000 from the Forest Service.

The interpretations and predictions concerning use and management found in this report are based on the soil scientist's knowledge and understanding of the conditions recognized and measured in the time allotted to this inventory. By classifying the soils, the soil scientist can also bring information concerning use and management of a particular soil from other survey areas where this same soil occurs and has been recognized and studied. Because of the different survey intensity levels use to complete this survey, the use and management interpretations and predictions should be considered based on the amount of examinations and measurement that were made.

General Soils Map

The general soil map shows map units which consist of many individual soils. A map unit typically is made up of one or more soils of major extent and several soils of minor extent. Map units are named for the major soils occurring in the unit. The soils in one unit can occur in other units. The soils are classified at the series level or at a higher taxonomic level.

The map furnishes a broad perspective of the soils in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. General areas which are capable of timber production or range production can be identified on the map. Likewise, general areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of the generalization of map units and the small scale of the map, the location of specific soils are not shown. The map and map unit information is not suitable for Forest or project level land management planning. It gives a very general overview of soil conditions and is only suitable for State or Regional planning.

There are three soil temperature zones in the survey area; (1) Mesic, (2) Frigid, and (3) Cryic. Soils within these zones have been grouped principally on the basis of soil differences that are related to differences in parent rock.

Soils of the Mesic Zone

The mesic soil temperature zone is located in the western part of the soil survey area. In this zone the topography consists of tabular ridges and mountainsides that are deeply entrenched by rivers and streams that flow westward. Elevations range from 2,000 feet to 8,500 feet. Annual precipitation ranges from 40 inches to more than 60 inches, and much of it falls as snow. The soil ranges from less than 10 inches to more than 60 inches deep to bedrock. Rock outcrop is common. The mesic zone makes up 53 percent of the survey area.

There are six map units in the mesic zone. The soils in these map units formed in material weathered from slates and schists, volcanic lahars, and granitic rocks. The plant cover is dominantly forest of conifers and hardwoods, and there are scattered areas of brush.

1. Cohasset-McCarthy-Crozier

Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from andesitic lahar.

This map unit occurs on mountainsides and the tops and shoulders of tabular ridges. Slope is 2 to 75 percent. The vegetation is typically dense stands of the Mixed Conifer-Pine and Mixed Conifer-Fir series. Elevation is 2,000 to 6,000 feet. Average annual precipitation is 40 to 60 inches or more at the higher elevations, much of which falls as snow.

This unit makes up about 8 percent of the survey area. It is about 45 percent Cohasset soils, 25 percent McCarthy soils, and 15 percent Crozier soils. The remaining 15 percent consist of minor components.

The Cohasset soils have a surface layer of brown loam and a subsoil of strong brown gravelly clay loam. The depth to the weathered andesitic lahar ranges from 40 to 80 inches. These soils are well drained.

The McCarthy soils have a surface layer of brown gravelly sandy loam and a subsoil of brown very gravelly loam. The depth to the slightly weathered andesitic lahar ranges from 20 to 40 inches. These soils are well drained.

The Crozier soils have a surface layer of dark brown loam and a subsoil of yellowish red cobbly loam. The depth to slightly weathered andesitic lahar ranges from 20 to 40 inches. These soils are well drained.

Minor components in this unit are the very deep Aiken soils and the shallow Ledmount soils.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas, maintaining the soil depth of the McCarthy and Crozier soils, and the low subsoil strength of the Cohasset soils.

2. McCarthy-Ledmount

Shallow and moderately deep soils that are well drained and somewhat excessively drained; formed in material weathered from andesitic lahar.

This map unit is in the western half of the survey area at elevations of 2,000 feet to 6,000 feet. These soils are on mountainsides and the tops, and sides of volcanic tabular ridges. Slopes are 2 to 75 percent. The vegetation is typically the Mixed Conifer-Pine series on the McCarthy soils and the Greenleaf Manzanita series on the Ledmount soils. Average annual precipitation is 40 to 60 inches or more at the higher elevations, much of which falls as snow.

GENERAL SOIL MAP
ELDORADO NATIONAL FOREST AREA

LEGEND
General Soils Map
Eldorado National Forest Area, California
Parts of Alpine, Amador, El Dorado and Placer Counties

MESIC ZONE

1 Cohasset-McCarthy-Crozier: Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from andesitic lahar.

2 McCarthy-Ledmount: Shallow and moderately deep soils that are well drained and somewhat excessively drained; formed in material weathered from andesitic lahar.

3 Jocal-Mariposa: Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from metasedimentary rock.

4 Chaix-Pilliken-Holland: Moderately deep, deep, and very deep soils that are well drained and somewhat excessively drained; formed in material weathered from granitic rock.

5 Rock outcrop-Maymen-Lithic Xerumbrepts: Shallow soils that are somewhat excessively drained and excessively drained; formed in material weathered from metasedimentary, andesitic lahar, and granitic rock.

6 Hartless-Neuns-Mieruf: Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from metasedimentary rock.

FRIGID ZONE

7 Waca-Windy: Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from andesitic lahar.

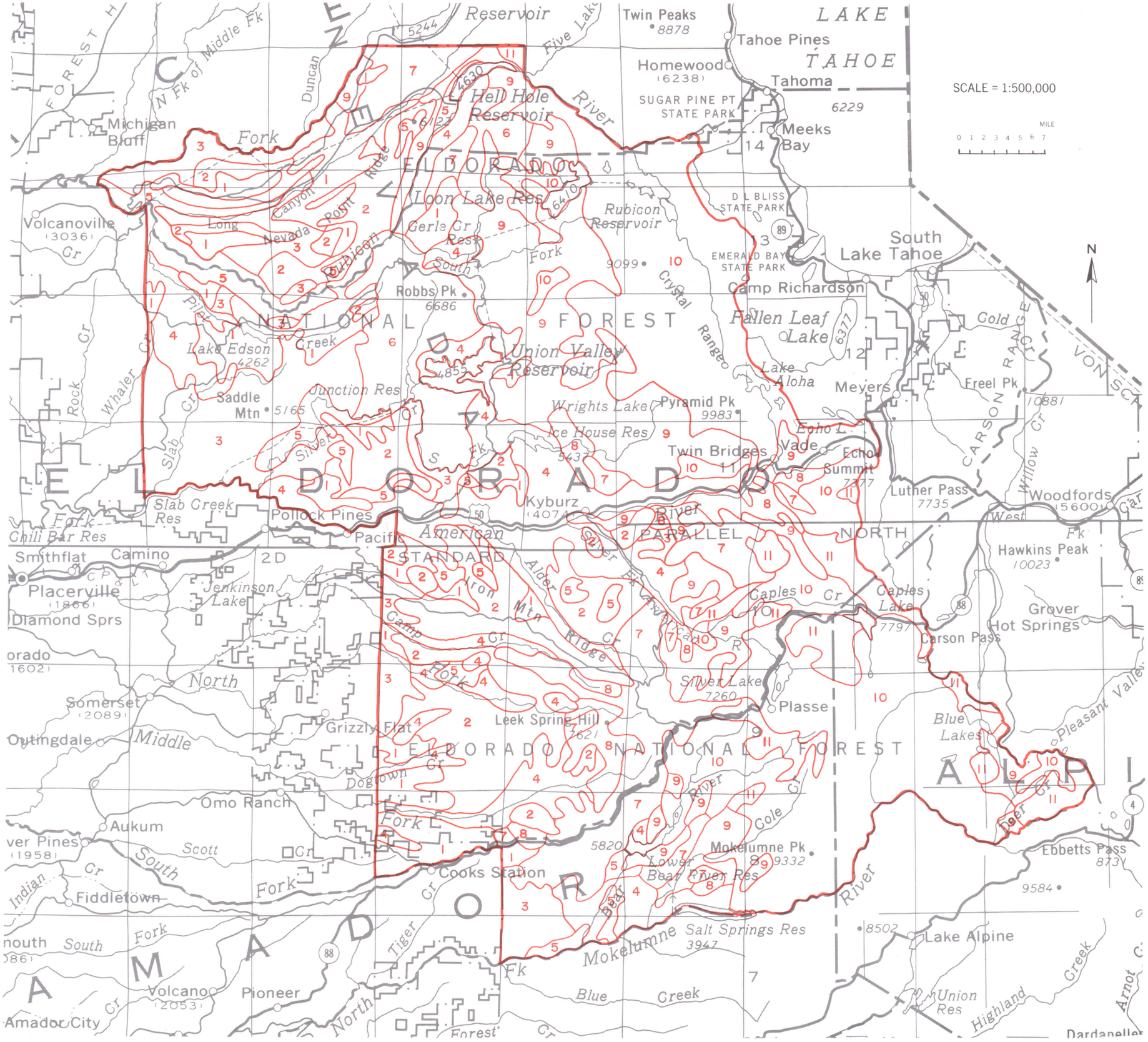
8 Ledford-Notned-Lumberly: Moderately deep, deep, and very deep soils that are somewhat excessively drained and well drained; formed in material weathered from granitic rock, colluvium, and glacial material composed primarily granitic rock.

9 Tallac-Gerle-Xerumbrepts: Moderately deep, deep, and very deep soils
that are moderately well drained and well drained; formed in material weathered from alluvium, glacial till, and outwash.

CRYIC ZONE

10 Rock Outcrop-Cryumbrepts: Glaciated rock outcrop and moderately deep, deep,and very deep soils that are well drained to poorly drained; formed in material weathered from alluvium, glacial till and outwash, and granitic rock.

11 Lithic Cryumbrepts-Andic Cryumbrepts: Shallow, moderately deep, and deep soils that are excessively drained and well drained; formed in material weathered from andesitic lahar.



This unit makes up about 13 percent of the survey area. It is about 75 percent McCarthy soils, and 15 percent Ledmount soils. The remaining 10 percent consist of minor components.

The McCarthy soils have a surface layer of brown gravelly sandy loam and a subsoil of brown very gravelly loam. The depth to the slightly weathered andesitic lahar ranges from 20 to 40 inches. These soils are well drained.

The Ledmount soils have a surface layer of dark grayish brown cobbly sandy loam. The depth to slightly fractured andesitic lahar ranges from 10 to 20 inches. These soils are well drained or somewhat excessively drained.

Minor components include Rock outcrop, the deep or very deep Cohasset soils and the moderately deep Crozier soils

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and maintaining the soil depth.

3. Jocal-Mariposa

Moderately deep, deep and very deep soils that are well drained; formed in material weathered from metasedimentary rock.

This map unit is in the western portion of the survey area at elevations of 2,000 to 6,500 feet. These soils are on ridgetops and mountainsides. Slopes are 5 to 75 percent. The Mixed Conifer-Pine series is the dominant vegetation. The Maple-Alder-Dogwood series is along some of the major drainages. Average annual precipitation is 40 to 60 inches, much of which falls as snow.

This map unit makes up about 8 percent of the survey area. It is about 70 percent Jocal soils and 20 percent Mariposa soils. The remaining 10 percent consist of minor components.

The Jocal soils have a surface layer of brown loam and a subsoil of reddish yellow silty clay loam. The depth to weathered metasedimentary bedrock ranges from 60 inches or more. These soils are well drained.

The Mariposa soils have a surface layer of strong brown gravelly silt loam and a subsoil of reddish yellow gravelly silty clay loam. The depth to partly fractured and uptilted metasedimentary bedrock ranges from 10 to 35 inches. These soils are well drained.

Minor components include Rock outcrop and the very deep Sites soils.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and the maintaining the soil depth on the Mariposa soils.

4. Chaix-Pilliken-Holland

Moderately deep, deep, and very deep soils that are well drained and somewhat excessively drained; formed in material weathered from granitic rock.

This map unit is along the major drainages in the western portion of the survey area at elevations of 2,500 to 6,000 feet. These soils are on mountainsides. Slopes are 5 to 75 percent. The Mixed Conifer-Pine series is the dominant vegetation. Average annual precipitation is 40 to 65 inches, much of which falls as snow.

This unit makes up about 12 percent of the survey area. It is about 40 percent Chaix soils, 25 percent Pilliken soils, and 15 percent Holland soils. The remaining 20 percent consist of minor components.

The Chaix soils have a surface layer of grayish brown coarse sandy loam and a subsoil of light yellowish brown coarse sandy loam. The depth to weathered granitic rock ranges from 20 to 40 inches. These soils are well drained.

The Pilliken soils have a surface layer of dark grayish brown coarse sandy loam and a subsoil of very pale brown gravelly coarse sandy loam. The depth to highly weathered granitic rock is 40 to 60 inches. These soils are well drained.

The Holland soils have a surface layer of brown loam and a subsoil of reddish yellow sandy clay loam. The depth to weathered granitic rock is 60 inches or more. These soils are on slopes ranging from 5 to 75 percent slopes and are well drained.

Minor components include Rock outcrop, the moderately deep Bighill soils and the very deep Musick soils.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas, maintaining the soil depth, low available water capacity of the Chaix soils, and the low subsoil strength of the Holland soils.

5. Rock Outcrop-Maymen-Lithic Xerumbrepts

Shallow soils that are somewhat excessively drained and excessively drained; formed in material weathered from metasedimentary, andesitic lahar, and granitic rock.

This map unit is in the western portion of the survey area and is mainly associated with the steep river cayons, backslopes, and mountainsides at elevations of 2,400 to 8,500 feet. Slopes are 2 to 100 percent. CALVEG series on this unit are the Canyon Live Oak series, Mountain Whitethorn series, and the Huckleberry Oak series. Average annual precipitation is 45 to 70 inches, much of which falls as snow.

This unit makes up about 7 percent of the survey area. It is about 30 percent Rock outcrop, 20 percent Maymen soils and 15 percent Lithic Xerumbrepts. The remaining 35 percent consist of minor components.

Rock outcrop occurs as small isolated outcroppings and as massive exposures.

The Maymen soils have a surface layer of pale brown gravelly loam and a subsoil of light brown gravelly loam. Depth to partly fractured and uptilted metamorphic rock is 10 to 20 inches. These soils are on backslopes and mountainsides with slopes ranging from 2 to 100 percent and are somewhat excessively drained.

Lithic Xerumbrepts soils have a dark surface layer and coarse textures. Depth to hard rock is 10 to 20 inches. These soils are on mountainsides with slopes ranging from 15 to 100 percent and are somewhat excessively drained or excessively drained.

Minor components include the shallow excessively drained Ledmount soils and the moderately deep Mariposa soils.

This unit is use mainly for wildlife habitat and limited summer range.
The main concerns for management on this unit include the potential erosion hazard of runoff from these areas on to adjacent disturbed areas and maintaining the soil depth of the Maymen soils and Lithic Xerumbrepts.

6. Hartless-Neuns-Mieruf

Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from metasedimentary rock.

This map unit occurs on ridgetops, mountainsides and canyons at elevations of 2,400 to 7,900 feet. Slopes are 5 to 100 percent. The Mixed Conifer-Pine series is the dominant vegetation, but the Mountain Whitethorn series is found within the unit. Average annual precipitation is 50 to 65 inches, much of which falls as snow.

This unit makes up about 5 percent of the survey area. It is about 35 percent Hartless soils, 20 percent Neuns soils, and 10 percent Mieruf soils. The remaining 35 percent consist of minor components.

The Hartless soils have a surface layer of very dark grayish brown very gravelly loam and a subsoil of strong brown very gravelly fine sandy loam. The depth to weathered metasedimentary bedrock ranges from 40 to 60 inches or more. These soils are on slopes ranging from 5 to 75 percent and are well drained.

The Neuns soils have a surface layer of yellowish brown gravelly loam and a subsoil of reddish yellow very cobbly sandy loam. The depth to hard fractured metasedimentary bedrock ranges from 20 to 40 inches. These soils are on slopes ranging from 15 to 100 percent and are well drained.

The Mieruf soils have a surface layer of dark brown very gravelly loam and a subsoil reddish yellow gravelly loam. The depth to weathered fractured metasedimentary rock is 40 to 60 inches. These soils are on slopes ranging from 5 to 75 percent and are well drained.

Minor components include the deep and moderately deep Hangtown and Smokey soils at higher elevations (5,800 to 7,900 feet), and the shallow, somewhat excessively drained or excessively drained Lithic Xerumbrepts.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas, maintaining the soil depth of the Neuns soils, and the low available water capacity of the Nuens and Hartless soils.

Soils of the Frigid Zone

The frigid soil temperature zone is at elevations of 5,400 to 10,000 feet. In this zone the topography is highly variable, consisting of glacial deposits, granitic mountainsides and volcanic mountainsides. Annual precipitatiion ranges from 55 to 70 inches, most of which fall as snow. The soils range from less than 10 inches to more than 60 inches deep. Rock outcrop is common throughout this zone. The plant cover is dominantly forests of red and white fir with numerous wet areas.

The frigid zone makes up 19 percent of the survey area. Three map units makeup this zone.

7. Waca-Windy

Moderately deep, deep, and very deep soils that are well drained; formed in material weathered from andesitic lahar.

This map unit occurs on mountainsides at elevations of 6,000 feet to 10,000 feet. Slopes are 5 to 50 percent. The Red Fir series is the dominant vegetation. Average annual precipitation is 45 to 80 inches, most of which falls as snow.

This unit makes up about 5 percent of the survey area. It is about 65 percent Waca soils, and 25 percent Windy soils. The remaining 10 percent consist of minor components.

The Waca soils have a surface layer of dark grayish brown cobbly sandy loam and a subsoil of brown very cobbly sandy loam. The depth to the weathered andesitic lahar ranges from 20 to 40 inches. These soils are well drained.

The Windy soils have a surface layer of yellowish brown gravelly sandy loam and a subsoil of light yellowish brown extremely cobbly sandy loam. The depth to weathered andesitic lahar ranges from 40 to 60 inches or more. These soils are well drained.

Minor components include the shallow excessively drained Lithic Cyrumbrepts and the somewhat poorly drained or poorly drained Cryumbrepts along drainages.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and maintaining the soil depth of the Waca soils.

8. Ledford-Notned-Lumberly

Moderately deep, deep, and very deep soils that are somewhat excessively drained and well drained; formed in material weathered from granitic rock, colluvium and glacial material composed primarily of granitic rock.

This map unit occurs on glacial moraines and outwash, and mountainsides at elevations of 5,600 feet to 8,500 feet. Slopes are 2 to 50 percent. The Red Fir and Mixed Conifer-Fir series are the dominant vegetation. Average annual precipitation is 55 to 70 inches, most of which falls as snow.

This unit makes up about 5 percent of the survey area. It is about 45 percent Ledford soils, 25 percent Notned soils, and 20 percent Lumberly soils. The remaining 10 percent consist of minor components.

The Ledford soils have a surface layer of dark brown sandy loam and a subsoil of yellowish brown coarse sandy loam. The depth to highly weathered granitic rock ranges from 40 to 60 inches. These soils are somewhat excessively drained.

The Notned soils have a surface layer of dark brown bouldery coarse sandy loam and a subsoil of brown very cobbly coarse sandy loam. The soil is 60 inches or more deep. These soils are well drained.

The Lumberly soils have a surface layer of grayish brown gravelly coarse sandy loam and a subsoil of light brown gravelly coarse sandy loam. The depth to weathered granitic rock ranges from 20 to 40 inches. These soils are well drained.

Minor components include Rock outcrop and the shallow, somewhat excesively drained or excessively drained Lithic Xerumbrepts.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the high hazard of erosion on disturbed areas, and maintaining the soil depth on the Lumberly soils.

9. Tallac-Gerle-Xerumbrepts

Moderately deep, deep, and very deep soils that are moderately well drained and well drained; formed in material weathered from alluvium, glacial till, and outwash.

This map unit occurs on moraines and outwash plains at elevations of 5,400 to 9,000 feet. Slopes are 2 to 75 percent. The Red Fir series is the dominant vegetation on the unit, but areas of Mixed Conifer-Fir series and the Huckleberry Oak series are found throughout the unit. Average annual precipitation is 50 to 70 inches, most of which falls as snow.

This unit makes up about 9 percent of the survey area. It is about 32 percent Tallac soils, 19 percent Gerle soils, and 13 percent Xerumbrepts. The remaining 36 percent consist of minor components.

The Tallac soils have a surface layer of very dark grayish brown very cobbly sandy loam and a subsoil of yellowish brown very gravelly sandy loam. The soil is 40 to 60 inches deep or more. These soils are on lateral and terminal moraines and glacial outwash on slopes ranging from 2 to 75 percent and are moderately well drained.

The Gerle soils have a surface layer of dark brown sandy loam and a subsoil of yellowish brown sandy loam. The soil is 60 inches or more deep. These soils are on ground moraines and outwash plains on slopes ranging from 2 to 50 percent and are well drained.

Xerumbrepts are moderately deep or deep, moderately well drained or well drained soils formed in glacially deposited material. Typically they have dark surface layers and sandy or loamy textures throughout the profile. Rock fragment content in the profile is highly variable. In some areas the surface layer is stony or bouldery.

Minor components include the moderately deep, moderately well drained or well drained Tinker soils, the very deep well drained Notned soils, the somewhat poorly drained or poorly drained Cryumbrepts along drainages, the poorly drained or very poorly drained Aquepts, the somewhat poorly drained or moderately well drained Umbrepts, and the deep or very deep, well drained Zeibright soils at the lower elevations.

This unit is used mainly for timber production. It is also used for summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and the high amounts of rock fragments in the soil profile.

Soils of the Cryic Zone

The cryic soil temperature zone is found at elevations of 6,000 to 10,000 feet. This crest zone is characterized by glaciated terrain consisting of jagged peaks, numerous lakes, and U-shaped valleys with steep walls and flat floors. Annual precipitatiion ranges from 55 to 70 inches, most of which fall as snow. The soils range from less than 10 inches to more than 60 inches deep. Rock outcrop is common throughout this zone. This area is dominantly barren with pockets of lodgepole pine, red fir, and hemlock forest and numerous wet areas.

The cryic zone makes up 28 percent of the survey area. Two map units makeup this zone.

10. Rock Outcrop-Cryumbrepts

Glaciated rock outcrop and moderately deep, deep, and very deep soils that are well drained to poorly drained; formed in material weathered from alluvium, glacial till and outwash, and granitic rock.

This map unit occurs on the eastern side of the survey area at elevations of 6,500 to 9,500 feet and is mainly associated with moraines, terraces and alluvial fans in the glaciated Wilderness areas. Slopes are 2 to 75 percent. The Red Fir series is the dominate vegetation on the unit, but the Lodgepole Pine series, the Sedge-Rush series, Willow series, and the Alder series are also found throughout the unit. Average annual precipitation is 45 to 70 inches, most of which falls as snow.

This unit makes up about 23 percent of the survey area. It is about 80 percent Rock outcrop and 10 percent Cryumbrept soils. The remaining 10 percent consist of minor components.

Glaciated rock outcrop consists of granitic, basic igneous, undifferentiated metamorphic, metasedimentary and metavolcanic rock types.

Cryumbrepts are moderately deep, deep or very deep, well drained to poorly drained soils formed in glacial outwash or alluvium. Typically they have dark surfaces and sandy or loamy textures throughout the profile. Rock fragment content in the profile is highly variable. Poorly drained areas occur along drainways and in basins. In some areas the surface layer is stony or bouldery.

Minor components include the shallow and moderately deep Orthents and 2he poorly or very poorly drained Aquepts and Umbrepts.

This unit is used mainly for recreation and summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and disturbance of the poorly drained soil areas.

11. Lithic Cryumbrepts-Andic Cryumbrepts

Shallow, moderately deep, and deep soils that are excessively drained and well drained; formed in material weathered from andesitic lahar.

This map unit occurs on the eastern side of the survey area at elevations of 6,000 to 10,000 feet and is mainly associated with ridgetops and mountainsides along the crest of the Sierra Nevada in the Wilderness areas. Slopes are 5 to 75 percent. The Mule Ears series dominate vegetation on the ridgetops but Mountain Hemlock and Red Fir series occur in pockets on the mountainsides. Areas of the Mountain Whitethorn, Lodgepole Pine and the Alder series are also found throughout the unit. Average annual precipitation is 45 to 70 inches, most of which falls as snow.

This unit makes up about 5 percent of the survey area. It is 70 percent Lithic Cryumbrepts and 20 percent Andic Cryumbrepts. The remaining 10 percent consist of minor components.

Lithic Cryumbrepts are shallow, excessively drained and formed in material weathered from andesitic lahar. They are loamy and have a highly variable rock fragment content. Typically the surface horizons are dark.

Andic Cryumbrepts are moderately deep or deep, well drained soils formed in material weathered from andesitic lahar. Typically they have dark surface horizons with loamy textures and highly variable rock fragment content throughout the profile.

Minor components include Rock outcrop and the moderately deep or deep, poorly drained to well drained Cryumbrepts.

This unit is used mainly for recreation and summer range. The main concerns for management on this unit include the hazard of erosion on disturbed areas and the disturbance of the poorly drained soil areas.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils and miscellaneous areas have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Zeibright extremely gravelly coarse sandy loam is one of several phases in the Zeibright series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Aiken- Cohasset loams, 2 to 30 percent slopes is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Cohasset-McCarthy association, 2 to 30 percent slopes is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be

made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Aquepts and Umbrepts, 0 to 15 percent slopes is an undifferentiated group in this survey area.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

This survey was mapped at three levels of detail. At the most detailed level, map units are narrowly defined. This means that map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals.

Table 1 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Table 1 Acreage and Proportionate Extent of the Map Units

Map Symbol	Map Unit Name	Acres	Percent of Survey Area
101	Aiken-Cohasset loams, 2 to 30 percent slopes	1,060	0.2
102	Andic Cryumbrepts-Lithic Cryumbrepts association, 15 to 50 percent slopes	8,232	1.2
103	Aquepts and Umbrepts, 0 to 15 percent slopes	4,877	0.7
104	Bighill-Musick complex, 50 to 75 percent slopes	415	0.1
105	Bighill-Rock outcrop-Dome complex, 5 to 30 percent slopes	219	0.1
106	Chaix coarse sandy loam, 30 to 75 percent slopes	13,892	2.0
107	Chaix-Pilliken coarse sandy loams, 5 to 30 percent slopes	16,952	2.5
108	Chaix-Pilliken coarse sandy loams, 30 to 75 percent slopes	15,894	2.3
109	Chaix-Rock outcrop complex, 30 to 75 percent slopes	6,950	1.0
110	Cohasset loam, 2 to 30 percent slopes	9,439	1.4
111	Cohasset-Hartless Variant complex, 2 to 30 percent slopes	580	0.1
112	Cohasset-McCarthy association, 2 to 30 percent slopes	11,862	1.7
113	Cohasset-McCarthy association, 30 to 50 percent slopes	8,272	1.2
114	Cohasset-McCarthy association, rhyolitic substratum, 5 to 30 percent slopes	3,140	0.4
115	Cohasset-McCarthy association, rhyolitic substratum, 30 to 75 percent slopes	7,721	1.1
116	Crozier-Cohasset loams, 5 to 30 percent slopes	3,120	0.5
117	Crozier-Cohasset loams, 30 to 50 percent slopes	289	0.1
118	Crozier-McCarthy complex, 5 to 30 percent slopes	5,458	0.8
119	Crozier-McCarthy complex, 30 to 50 percent slopes	3,879	0.6
120	Cryumbrepts association, 5 to 50 percent slopes	12,572	1.8

Table 1 Acreage and Proportionate Extent of the Map Units, continued

Map Symbol	Map Unit Name	Acres	Percent of Survey Area
121	Dome coarse sandy loam, 2 to 30 percent slopes	690	0.1
122	Dome-Zeibright complex, 2 to 30 percent slopes	1,724	0.3
123	Dome-Zeibright complex, 30 to 50 percent slopes	278	0.1
124	Dome Variant coarse sandy loam, 0 to 10 percent slopes	342	0.1
125	Fluvents, 0 to 10 percent slopes	302	0.1
126	Gerle coarse sandy loam, 2 to 30 percent slopes	571	0.1
127	Gerle-Notned complex, 2 to 30 percent slopes	7,564	1.1
128	Gerle-Tallac complex, 5 to 30 percent slopes	10,502	1.5
129	Gerle-Tallac complex, 30 to 50 percent slopes	1,786	0.2
130	Gerle-Umbrepts association, 2 to 15 percent slopes	2,245	0.3
131	Hangtown-Lithic Xerumbrepts complex, 15 to 50 percent slopes	3,433	0.5
132	Hangtown-Smokey complex, 5 to 30 percent slopes	710	0.1
133	Hangtown-Smokey complex, 30 to 50 percent slopes	687	0.1
134	Hartless very gravelly loam, 5 to 30 percent slopes	1,332	0.2
135	Hartless very gravelly loam, 30 to 50 percent slopes	2,966	0.4
136	Hartless-Mieruf very gravelly loams, 5 to 30 percent slopes	1,677	0.2
137	Hartless-Mieruf very gravelly loams, 30 to 50 percent slopes	1,225	0.2
138	Hartless-Mieruf very gravelly loams, 50 to 75 percent slopes	610	0.1
139	Hartless-Neuns complex, 15 to 30 percent slopes	1,011	0.2
140	Hartless-Neuns complex, 30 to 75 percent slopes	3,509	0.5
141	Hartless Variant very gravelly sandy loam, 30 to 50 percent slopes	260	0.1
142	Holland loam, 5 to 30 percent slopes	2,752	0.4
143	Holland loam, 30 to 50 percent slopes	997	0.1

101 - Aiken-Cohasset loams, 2 to 30 percent slopes.

This map unit is on the tops and sides of volcanic tabular ridges. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 50 to 60 inches.

This unit is 70 percent Aiken loam and 20 percent Cohasset loam. The percentage may vary from one area to another.

Included in this unit are small areas of Crozier and McCarthy soils. Also included in the Nevada Point Ridge area are small areas of slopes greater than 30 percent. Included areas make up about 10 percent of the total acreage.

The Aiken soil is very deep and well drained. It formed in material weathered from andesitic lahar. The surface layer is brown loam about 16 inches thick. The upper 20 inches of the subsoil is yellowish red clay loam. The lower 29 inches is yellowish red clay. The substratum material to a depth of 80 inches is strong brown clay loam.

Permeability of the Aiken soil is moderately slow. Available water capacity is high. Effective rooting depth is 65 to 120 inches. The maximum erosion hazard is moderate.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine and Douglas fir. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

102 - Andic Cryumbrepts-Lithic Cryumbrepts Association, 15 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on the Andic Cryumbrepts component of this unit. The Mule Ears series typically occurs on the Lithic Cryumbrepts component of this unit. Areas of the Lodgepole Pine, Mountain Hemlock, and Alder series are also found throughout the unit. Elevation is 7,000 to 10,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 60 percent Andic Cryumbrepts and 25 percent Lithic Cryumbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts, wet, and Waca soils. The Cryumbrepts, wet soil is along tributary drainages which are vegetated with willows, mixed grasses, and forbs. Also included are small areas of rock outcrop. Included areas make up about 15 percent of the total acreage.

The Andic Cryumbrepts is moderately deep or deep and well drained. It is formed in material weathered from andesitic lahar. Typically, the surface layer is dark with low bulk density. It is sandy loam, coarse sandy loam, or loam throughout the profile, with coarse fragments ranging from 15 to 85 percent.

Permeability of the Andic Cryumbrepts is moderately rapid. Available water capacity is very low to low. The short growing season limits the productivity of these soils. Effective rooting depth is 20 to 60 inches. The maximum erosion hazard is high.

The Lithic Cryumbrepts is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, or loam with coarse fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. The maximum erosion hazard is very high.

This unit is used mainly for recreation in Wilderness Areas. It is also used as summer range.

The Andic Cryumbrepts is used mainly for recreation and summer range. The main management concerns for this soil are steep slopes and the hazard of erosion. This soil is not available for the production of timber because of its isolated location in or adjacent to Wilderness areas.

The Lithic Cryumbrepts is used mainly for recreation and summer range. The main management concerns for this soil are the steep slopes, the high runoff potential, and the hazard of erosion. This soil is not timbered and is not suited to the production of timber because of the shallow depth.

103 - Aquepts and Umbrepts, 0 to 15 percent slopes.

This map unit is on broad valley flats and along drainages and the periphery of these areas. The Sedge-Rush series typically occurs on this unit. Elevation is 4,000 to 8,500 feet. The average annual precipitation is 50 to 70 inches.

These soils have no regular pattern of occurrence. Every delineation has at least one of the components and may have both. These soils are combined because the use and management are the same.

Included in this unit are small areas of Cryumbrepts, Dome, Dome Variant, Holland, Jocal, Pilliken, Tallac, Tinker, and Zeibright soils. Also included are small areas of a soil that are less than 20 inches deep to hard rock. Included areas make up about 10 percent of the total acreage.

The Aquepts is a very poorly drained or poorly drained soil that formed in alluvial material. Typically, it has dark surface layer and highly variable textures ranging from coarse textures to fine textures. The amount of gravel and cobbles is highly variable throughout the profile with some profiles having greater than 35 percent by volume.

Permeability of the Aquepts is very slow or slow. A reducing environment exists in these soils because the ground water table fluctuates to near the surface during the rainy season and during periods of high runoff. The maximum erosion hazard is low.

The Umbrepts is a somewhat poorly drained or moderately well drained soil that formed in alluvial material on the periphery of broad valley flats and drainages. Typically, it has a dark surface layer. The profile has stratified layers with textures ranging from clays to loams with 50 to 70 percent rock fragments.

Permeability of the Umbrepts is slow or moderately slow. The maximum erosion hazard is low.

This unit is used mainly for summer range.

This unit is well suited for intensive use as summer range. The main concerns in range management on this unit are seasonal flooding, a high seasonal water table and the stability of stream banks. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock. Overuse can reduce sod type plant cover and cause gully erosion.

104 - Bighill-Musick complex, 50 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,600 to 4,000 feet. The average annual precipitation is 50 to 60 inches.

This unit is 50 percent Bighill coarse sandy loam and 25 percent Musick loam. The percentage may vary from one area to another.

Included in this unit are small areas of Chaix, Holland, Lithic Xerumbrepts, and Pilliken soils. Included areas make up about 25 percent of the total acreage.

The Bighill soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 5 inches of the surface layer is dark grayish brown coarse sandy loam. The lower 12 inches is brown gravelly sandy loam. The subsoil is brown cobbly sandy loam about 15 inches thick. Weathered granitic rock is at a depth of 32 inches.

Permeability of the Bighill soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Musick soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 6 inches thick. The upper 18 inches of the subsoil is yellowish red clay loam. The lower 28 inches is red and yellowish red sandy clay loam. The upper 16 inches of the substratum is yellowish red gravelly sandy clay loam. The lower part to a depth of 71 inches is strong brown gravelly sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Musick soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for mixed conifers. The main concerns in producing and harvesting timber on this unit are the very steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Cable yarding system are suited to this unit because they protect the surface soil from excessive disturbances. The use of ground base equipment for site preparation is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. This unit is suited to only limited use as summer range because of very steep slopes.

105 - Bighill-Rock outcrop-Dome complex, 5 to 30 percent slopes.

This map unit is on mountainsides. Slope is 2 to 30 percent. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,000 to 5,300 feet. The average annual precipitation is 55 to 65 inches.

This unit is 30 percent Bighill coarse sandy loam, 30 percent rock outcrop, and 25 percent Dome coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Lithic Xerumbrepts, Pilliken, and Zeibright soils. Included areas make up about 15 percent of the total acreage.

The Bighill soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 5 inches of the surface layer is dark grayish brown coarse sandy loam. The lower 12 inches is brown gravelly sandy loam. The subsoil is brown cobbly sandy loam about 15 inches thick. Weathered granitic rock is at a depth of 32 inches.

Permeability of the Bighill soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

Rock outcrop occurs as isolated outcroppings and massive exposures of granitic rock. Runoff is very rapid. Large quanities of water may concentrate on soils downslope, which increases the hazard of erosion.

The Dome soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown coarse sandy loam about 7 inches thick. The subsoil is strong brown coarse sandy loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is gravelly coarse sandy loam.

Permeability of the Dome soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth of 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is poorly suited to the production of timber because of the areas of rock outcrop. The Bighill and Dome soils are suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this unit are the presence of Rock outcrop, maintaining soil depth, the low available water capacity, and the hazard of erosion. Potential surface runoff from Rock outcrop areas may require modification in skid trail layout, erosion control measures, and ground cover requirements to prevent erosion from concentrated flows. Rock outcrop on the surface hinders harvesting operations and can cause the breakage of timber when felled. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest slopes. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The production of forage is transitory and limited by the amount of competition from conifers.

106 - Chaix coarse sandy loam, 30 to 75 percent.

This moderately deep, somewhat excessively drained soil is on mountainsides. It formed in material weathered from granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 40 to 55 inches.

Typically, the surface layer is grayish brown and brown coarse sandy loam about 5 inches thick. The upper 8 inches of the subsoil is light yellowish brown coarse sandy loam. The lower 17 inches is very pale brown coarse sandy loam. Weathered granitic rock is at a depth of 30 inches. In some areas the surface layer is sandy loam or fine sandy loam.

Included in this unit are small areas of Bighill, Holland, Lithic Xerumbrepts, Musick, and Pilliken soils. Also included are small areas of rock outcrop. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Chaix soil is moderately rapid. Available water apacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is very high.

This unit is used mainly for timber production. It is also used for summer range.

The Chaix soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the low available water capacity, the steep and very steep slopes and hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Steep yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. This soil is suited to only limited use as summer range because of steep and very steep slopes.

107 - Chaix-Pilliken coarse sandy loams, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 45 to 55 inches.

This unit is 40 percent Chaix coarse sandy loam and 40 percent Pilliken coarse sandy loam. This percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Holland, Ledford, and Lithic Xerumbrepts soils. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage.

The Chaix soil is moderately deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the surface layer is grayish brown and brown coarse sandy loam about 5 inches thick. The upper 8 inches of the subsoil is light yellowish brown coarse sandy loam. The lower 17 inches is very pale brown coarse sandy loam. Weathered granitic rock is at a depth of 30 inches. In some areas the surface layer is sandy loam or fine sandy loam.

Permeability of the Chaix soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity, maintaining the soil depth and hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The production of forage is transitory and limited by the amount of competition from conifers.

108 - Chaix-Pilliken coarse sandy loams, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 45 to 55 inches.

This unit is 55 percent Chaix coarse sandy loam and 25 percent Pilliken coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Holland, Ledford, and Lithic Xerumbrepts. Also included are small areas of Rock outcrop. Included areas make up about 20 percent of the total acreage.

The Chaix soil is moderately deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the surface layer is grayish brown and brown coarse sandy loam about 5 inches thick. The upper 8 inches of the subsoil is light yellowish brown coarse sandy loam. The lower 17 inches is very pale brown coarse sandy loam. Weathered granitic rock is at a depth of 30 inches. In some areas the surface layer is sandy loam or fine sandy loam.

Permeability of the Chaix soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low avialable water capacity, the steep and very steep slopes, hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. This unit is suited to only limited use as summer range because of steep and very steep slopes.

109 - Chaix-Rock outcrop complex, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 6,000 feet. The average annual precipitation is 45 to 55 inches.

This unit is 40 percent Chaix coarse sandy loam and 40 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Holland, Lithic Xerumbrepts, Musick, and Pilliken soils. Included areas make up about 20 percent of the total acreage.

The Chaix soil is moderately deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the surface layer is grayish brown and brown coarse sandy loam about 5 inches thick. The upper 8 inches of the subsoil is light yellowish brown coarse sandy loam. The lower 17 inches is very pale brown coarse sandy loam. Weathered granitic rocks is at a depth of 30 inches. In some areas the surface layer is sandy loam or fine sandy loam.

Permeability of the Chaix soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is very high.

Rock outcrop occurs as isolated outcroppings and massive exposures of granitic rock. Runoff is very rapid. Large quanities of water may concentrate on soils downslope, which increases the hazard of erosion.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used for limited timber production. It is also used as limited summer range.

Much of this unit is poorly suited to the production of timber because of the areas of rock outcrop. The Chaix soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the presence of Rock outcrop, the low available water capacity, the steep and very steep slopes and hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Potential surface runoff from Rock outcrop areas may require modification in skid trail layout, erosion control measures, and ground cover requirements to prevent erosion from concentrated flows. Cable yarding systems are suited to this unit because they protect the surface soil from excessive disturbances. Rock outcrop on the surface hinders harvesting operations and can cause breakage of timber when felled. The use of ground base equipment for site prepartion is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This unit is suited to only limited use as summer range because of steep and very steep slopes.

110 - Cohasset loam, 2 to 30 percent slopes.

This deep or very deep and well drained soil is on the tops and sides of volcanic tabular ridges. It formed in material weathered from andesitic lahar. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,800 to 4,400 feet. The average annual precipitation is 50 to 60 inches.

Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Included in this unit are small areas of Aiken, Crozier, and McCarthy soils. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Cohasset soil is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

111 - Cohasset-Hartless Variant complex, 2 to 30 percent slopes.

This map unit is on the tops and sides of volcanic tabular ridges. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,200 to 5,500 feet. The average annual precipitation is 55 to 60 inches.

This unit is 45 percent Cohasset very gravelly loam and 30 percent Hartless Variant very gravelly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Ziebright soils. Also included are small areas of a soil similar to Cohasset that has greater than 35 percent rock fragments in the subsoil and a soil similar to Hartless Variant that has less than 35 percent rock fragments in the subsoil. In a few small areas the slope is greater than 30 percent. Included areas make up about 25 percent of the total acreage.

The Cohasset soil is very deep and well drained. It formed in material weathered from basaltic lahar. Typically, the surface layer is brown very gravelly loam about 7 inches thick. The upper 8 inches of the subsoil is brown gravelly loam. The lower 41 inches is brown and reddish brown gravelly clay loam. The substratum to a depth of 61 inches or more is light reddish brown gravelly sandy loam. In some areas the surface layer is loam.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth 60 inches or more. The maximum erosion hazard is moderate.

The Hartless Variant soil is deep or very deep and well drained. It formed in material weathered from basaltic lahar. Typically, the surface layer is brown very gravelly sandy loam about 12 inches thick. The subsoil is light brown gravelly sandy loam about 9 inches thick. The upper 20 inches of the substratum is pale brown very cobbly sandy loam. The lower part, to a depth of greater than 60 inches, is pale brown loamy sand. In some areas the surface layer is gravelly, cobbly, or very cobbly sandy loam.

Permeability of the Hartless Variant soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The productiion of forage is transitory and limited by the amount of competition from conifers.

112 - Cohasset-McCarthy association, 2 to 30 percent slopes.

This map unit is on mountainsides. Slope is 2 to 30 percent. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 50 percent Cohasset loam and 35 percent McCarthy gravelly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Aiken, Crozier, and Ledmount soils and rock outcrop. Also included are small areas of a soil similar to McCarthy that has less than 35 percent rock fragments in the subsoil and a soil similar to McCarthy that is over 40 inches deep. Included areas make up about 15 percent of the total acreage.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.
Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is moderate.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Cohasset soil is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

The McCarthy soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth and hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

113 - Cohasset-McCarthy association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 45 percent Cohasset loam and 40 percent McCarthy gravelly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Crozier and Ledmount soils and rock outcrop. Also included are small areas of a soil similar to McCarthy that has less than 35 percent rock fragments in the subsoil and a soil similar to McCarthy that is over 40 inches deep. Included areas make up about 15 percent of the total acreage.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is high.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Cohasset soil is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and the low subsoil strength. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. This soil is suited to only limited use as summer range because of steep slopes.

The McCarthy soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimiing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

114 - Cohasset-McCarthy association, rhyolitic substatum, 5 to 30 percent slope.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 45 percent Cohasset gravelly sandy loam and 40 percent McCarthy gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Ledmount soils and rock outcrop. Also included are small areas of a soil similar to Cohasset that is less than 40 inches deep. Included areas make up about 15 percent of the total acreage.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from rhyolitic rock. Typically, the surface layer is dark grayish brown and brown gravelly sandy loam about 5 inches thick. The subsoil is very pale brown gravelly sandy clay loam about 43 inches thick. The substratum is very pale brown loam about 9 inches thick. Highly weathered rhyolitic rock is at a depth of 57 inches.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is moderate.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from rhyolitic rock. Typically, the surface layer is brown gravelly loam about 11 inches thick. The subsoil is brown very cobbly loam about 13 inches thick. Slightly weathered and fractured rhyolitic rock is at a depth of 24 inches.

Permeability of the McCarthy soil is moderately rapid. Available water holding capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Cohasset soil is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Following road construction or timber harvest activities, road failures and landslides may occur. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

The McCarthy soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the hazard of erosion and maintaining the soil depth. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. Following road construction or timber harvest activities, road failures and landslides may occur. The production of forage is transitory and limited by the amount of competition from conifers.

115 - Cohasset-McCarthy association, rhyolitic substatum, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 40 to 60 inches.

This unit is 40 percent Cohasset gravelly sandy loam and 40 percent McCarthy gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Ledmount soils and rock outcrop. Also included are small areas of a soil similar to Cohasset that is less than 40 inches deep. Included areas make up about 20 percent of the total acreage.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from rhyolitic rock. Typically, the surface layer is dark grayish brown and brown gravelly sandy loam about 5 inches thick. The subsoil is very pale brown gravelly sandy clay loam about 43 inches thick. The substratum is very pale brown loam about 9 inches thick. Highly weathered rhyolitic rock is at a depth of 57 inches.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is high.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from rhyolitic rock. Typically, the surface layer is brown gravelly loam about 11 inches thick. The subsoil is brown very cobbly loam about 13 inches thick. Slightly weathered and fractured rhyolitic rock is at a depth of 24 inches.

Permeability of the McCarthy soil is moderately rapid. Available water holding capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Cohasset soil is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 165 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Following road construction and timber harvest activities, road failures and landslides may occur. This soil is suited to only limited use as summer range because of steep and very steep slopes.

The McCarthy soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are steep and very steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Following road construction and timber harvest activities, road failures and landslides may occur. This soil is suited to only limited use as summer range because of steep and very steep slopes.

116 - Crozier-Cohasset loams, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 55 percent Crozier loam and 35 percent Cohasset loam. The percentage may vary from one area to another.

Included in this unit are small areas of Aiken, Ledmount, and McCarthy soils. Also included are small areas of a soil similar to Crozier that have a subsoil of sandy loam. Included areas make up about 10 percent of the total acreage.

The Crozier soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark brown loam about 6 inches thick. The upper 10 inches of the subsoil is strong brown loam. The lower 18 inches is yellowish red cobbly loam. Fractured and weathered andesitic lahar is at a depth of 34 inches.

Permeability of the Crozier soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength, maintaining the soil depth, and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The production of forage is transitory and limited by the amout of competition from to conifers.

117 - Crozier-Cohasset loams, 30-50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 60 percent Crozier loam and 30 percent Cohasset loam. The percentage may vary from one area to another.

Included in this unit are small areas of McCarthy and Ledmount soils. Also included are small areas of a soil similar to Crozier that have a subsoil of sandy loam. Included areas make up about 10 percent of the total acreage.

The Crozier soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark brown loam about 6 inches thick. The upper 10 inches of the subsoil is strong brown loam. The lower 18 inches is yellowish red cobbly loam. Fractured and weathered andesitic lahar is at a depth of 34 inches.

Permeability of the Crozier soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Cohasset soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown or dark brown loam about 19 inches thick. The upper 9 inches of the subsoil is strong brown gravelly clay loam. The lower 16 inches is yellowish red gravelly clay loam. Weathered andesitic lahar is at a depth of 44 inches. In some areas the surface layer is sandy loam or gravelly sandy loam.

Permeability of the Cohasset soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 80 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to over 225 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, the low subsoil strength, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods.

Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. This unit is suited to only limited use as summer range because of steep slopes.

118 - Crozier-McCarthy complex, 5 to 30 percent slopes.

This map unit is on mountainsides. Slope is 5 to 30 percent. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 60 percent Crozier loam and 30 percent McCarthy gravelly sandy loam. The percentage may vary from one area to another.

Included in this map unit are small areas of Cohasset and Ledmount soils. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is over 40 inches deep. Included areas make up about 10 percent of the total acreage.

The Crozier soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark brown loam about 6 inches thick. The upper 10 inches of the subsoil is strong brown loam. The lower 18 inches is yellowish red cobbly loam. Fractured and weathered andesitic lahar is at a depth of 34 inches.

Permeability of the Crozier soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concern in producing and harvesting timber on this unit is maintaining the soil depth and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tent to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

119 - Crozier-McCarthy complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 40 percent Crozier loam and 40 percent McCarthy gravelly sandy loam. The percentage may vary from one area to another.

Included in this map unit are small areas of Cohasset and Ledmount soils. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is over 40 inches deep. In a few areas slopes are over 50 percent. Included areas make up about 20 percent of the total acreage.

The Crozier soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark brown loam about 6 inches thick. The upper 10 inches of the subsoil is strong brown loam. The lower 18 inches is yellowish red cobbly loam. Fractured and weathered andesitic lahar is at a depth of 34 inches.

Permeability of the Crozier soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to the intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. This unit is suited to only limited use as summer range because of steep slopes.

120 - Cryumbrepts association, 5 to 50 percent slopes.

This map unit is on glacial moraines, outwash terraces, and alluvial plains. The Red Fir series typically occurs on the Cryumbrepts component of this unit. The Alder series typically occurs on the Cryumbrepts, wet component. Elevation is 6,500 to 9,500 feet. The average annual precipitation is 50 to 70 inches.

This unit is 55 percent Cryumbrepts and 15 percent Cryumbrepts, wet. The percentage may vary from one area to another.

Included in this unit are small areas of a soil similar to Cryumbrepts that has a thinner, lighter-colored surface horizon and a soil similar to Cryumbrepts that has a summer temperature which varies more than 9°F from the winter soil temperature. Also included are small areas of rock outcrop. Included areas make up about 30 percent of the total acreage.

The Cryumbrepts is moderately deep, deep, or very deep and moderately well drained or well drained. It formed in glacially deposited material. Typically, it has a dark surface and loamy sand, coarse sandy loam, or sandy loam textures throughout the profile with rock fragments ranging from 15 to 60 percent. In some areas the surface layer is stony or bouldery.

Permeability of the Cryumbrepts is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 60 inches or more. The maximum erosion hazard is high.

The Cryumbrepts, wet is moderately deep, deep, or very deep and somewhat poorly drained or poorly drained. It formed in mixed glacial alluvium. The Cryumbrepts, wet is along drainages, and on flood plains on slopes of 5 to 30 percent. Typically, the surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 5 to 60 percent.

Permeability of the Cryumbrepts, wet is moderately rapid. Effective rooting depth is 20 to 40 inches, with a water table generally within 30 inches of the surface. The maximum erosion hazard is high.

The Cryumbrepts is used mainly for recreation and summer range. The main concerns in management on this soil are the steep slopes and the hazard of erosion. This soil is not available for the production of timber because of its isolated location in or adjacent to wilderness areas.

The Cryumbrepts, wet is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and seasonal flooding. This soil is not suited to the production of timber. Grazing should be delayed until the soil has drained and is firm enough to withstand tramping by livestock.

121 - Dome coarse sandy loam, 2 to 30 percent slopes.

This very deep, well drained soil is on outwash plains. It formed in glacial outwash composed primarilay of granitic rock. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 4,800 to 5,600 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is brown coarse sandy loam about 7 inches thick. The subsoil is strong brown coarse sandy loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is a gravelly sandy loam.

Included in this unit are small areas of Aquepts, Dome Variant, Pilliken, and Zeibright soils. Also included are small areas of a soil similar to Dome that has a dark colored surface horizon. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Dome soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Dome soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The low available water capacity in the surface layer significantly reduces conifer seeding survival on south and southwest facing slopes. The production of forage is transitory and limited by the amount of competition from conifers.

122 - Dome-Zeibright complex, 2 to 30 percent slopes.

This map unit is on outwash plains, mountainsides, and ridges. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 4,800 to 5,600 feet. The average annual precipitation is 55 to 60 inches.

This unit is 50 percent Dome coarse sandy loam and 30 percent Ziebright extremely gravelly coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Aquepts, Dome Variant, and Pilliken soils. Also included are small areas of a soil similar to Dome that has a dark colored surface horizon and a soil similar to Zeibright that has a light colored surface horizon. Included areas make up about 20 percent of the total acreage.

The Dome soil is very deep and well drained. It formed in glacial outwash composed primarily of granitic rock. Typically, the surface layer is brown coarse sandy loam about 7 inches thick. The subsoil is strong brown coarse sandy loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is a gravelly sandy loam.

Permeability of the Dome soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Zeibright soil is deep or very deep and well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is dark grayish brown extremely gravelly coarse sandy loam about 10 inches thick. The upper 25 inches of the substratum is brown and light yellowish brown extremely cobbly coarse sandy loam. The lower part to a depth of 61 inches is brownish yellow and light yellowish brown very cobbly and extremely stony coarse sandy loam. In some areas the surface layer is gravelly sandy loam or cobbly sandy loam.

Permeability of the Zeibright soil is moderately rapid. Available water capacity is very low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seeding survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedling difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

123 - Dome-Zeibright complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,300 to 5,600 feet. The average annual precipitation is 55 to 60 inches.

This unit is 50 percent Dome coarse sandy loam and 30 percent Ziebright extremely gravelly coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Lithic Xerumbrepts and Pilliken soils and rock outcrop. Also included are small areas of a soil similar to Dome that has a dark colored surface horizon and a soil similar to Ziebright that has a light colored surface horizon. Included areas make up about 20 percent of the total acreage.

The Dome soil is very deep and well drained. It formed in glacial outwash composed primarily of granitic rock. Typically, the surface layer is brown coarse sandy loam about 7 inches thick. The subsoil is strong brown coarse sandy loam about 24 inches thick. The substratum to a depth of 60 inches or more is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is a gravelly sandy loam.

Permeability of the Dome soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is greater than 60 inches. The maximum erosion hazard is high.

The Zeibright soil is deep or very deep and well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is dark grayish brown extremely gravelly coarse sandy loam about 10 inches thick. The upper 25 inches of the substratum is brown and light yellowish brown extremely cobbly coarse sandy loam. The lower part to a depth of 61 inches is brownish yellow and light yellowish brown very cobbly and extremely stony coarse sandy loam. In some areas the surface layer is gravelly sandy loam or cobbly sandy loam.

Permeability of the Zeibright soil is moderately rapid. Available water capacity is very low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this unit are the low available water capacity, the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity may significantly reduces conifer seeding survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedling difficult. This unit is suited to only limited use as summer range because of steep slopes.

124 - Dome Variant coarse sandy loam, 0 to 10 percent slopes.

This very deep, somewhat poorly drained soil is in small basins on glacial outwash plains. It formed in outwash from dominantly granitic rock. The Lodgepole Pine series typically occurs on this unit. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is variegated brown, pale brown, and light yellowish brown coarse sandy loam about 22 inches thick. The subsoil is variegated very pale brown and brownish yellow coarse sandy loam about 33 inches thick. The substratum is variegated very pale brown, brownish yellow, and pinkish white coarse loamy sand to a depth of 60 inches or more. Depth to the water table fluctuates between 40 and 80 inches or more during summer and fall, and 20 and 60 inches during winter and spring.

Included in this unit are small areas of Aquepts, Dome, Umbrepts, and Zeibright soils. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Dome Variant soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is more than 60 inches, but may be limited for some plants by the water table. The maximum erosion hazard is low.

This unit is used mainly for timber production. It is also used for summer range.

This unit is poorly suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in the production and harvesting timber on this unit are the seasonal water table and the hazard of erosion. Because the rooting depth is restricted by a seasonally high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong. The removal of timber on this unit may cause reforestation problems associated with a high water table. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion.

125 - Fluvents, 0 to 10 percent slopes.

This very deep, moderately well drained or somewhat poorly drained soil occurs along narrow drainageways. It formed in mixed alluvial material. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,000 to 4,800 feet. The average annual precipitation is 50 to 60 inches.

Typically, it has light colored surfaces layers but may have thin dark strata. Textures are sandy loams to sands and are stratified. Rock fragment content is highly variable and some profiles contain up to 55 percent by volume.

Included in this unit are small areas of Aquepts, Holland, Jocal, Musick, Pilliken, and Umbrepts soils. Also included are small areas of riverwash and a soil similar to Fluvents that has some subsoil development. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Fluvents ranges from rapid to moderately slow. Available water capacity is moderate. Effective rooting depth is more than 60 inches, but may be limited for some plants by the water table, which fluctuates between 10 and 50 inches in the winter and 40 and 100 inches in the summer. The maximum erosion hazard is low.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in the production and harvesting of timber on this unit are the seasonal water table and the hazard of erosion. Because the rooting depth is restricted by a seasonally high water table, trees are occasionally subject to windthrow when the soil is wet and winds are strong. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion.

126 - Gerle coarse sandy loam, 2 to 30 percent slopes.

This very deep and well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,600 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is dark brown and dark yellowish brown coarse sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown coarse sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is gravelly sandy loam.

Included in this unit are small areas of Cryumbrepts, Notned, and Tallac soils. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Gerle soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit is the the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

127 - Gerle-Notned complex, 2 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,600 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 55 percent Gerle sandy loam and 25 percent Notned bouldery coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Ledford, Lithic Xerumbrepts, Lumberly, Tallac, Tinker, and Umbrepts soils. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam and less commonly loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult.

Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

128 - Gerle-Tallac complex, 5 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,800 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 45 percent Gerle sandy loam and 35 percent Tallac very cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Notned, Tinker, and Umbrepts soils. Also included are small areas of rock outcrop and boulders. Included areas make up about 20 percent of the total acreage.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Tallac soil is deep to very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

129 - Gerle-Tallac complex, 30 to 50 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,800 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 45 percent Gerle sandy loam and 35 percent Tallac very cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Notned, Tinker, and Umbrepts soils. Also included are small areas of rock outcrop and boulders. Included areas make up about 20 percent of the total acreage.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations.Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

130 - Gerle-Umbrepts association, 2 to 15 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series typically occurs on the Gerle component of this unit. The Alder series typically occurs on the Umbrepts component of this unit. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 50 to 65 inches.

This unit is 60 percent Gerle sandy loam and 20 percent Umbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts, Notned, and Tallac soils. Also included are small areas of riverwash. Included areas make up about 20 percent of the total acreage.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is greater than 60 inches. The maximum erosion hazard is moderate.

Umbrepts are somewhat poorly drained or moderately well drained soils that formed in alluvial material along drainages and on glacial outwash on slopes of 2 to 9 percent. They have dark surface horizons. The profile has stratified layers with textures ranging from clays to loams with 50 to 70 percent rock fragments.

Permeability of the Umbrepts soil is slow or moderately slow. The maximum erosion hazard is moderate.

This unit is used for timber production. It is also used for summer range.

The Gerle soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concern in producing and harvesting timber on this soil is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

The Umbrepts soil is not suited to the production of timber because of poor drainage conditions. The main concerns in grazing animals on this soil are the seasonal water table and the hazard of stream bank erosion. Because the rooting depth is restricted by a seasonally high water table, trees growing in soils bordering the Umbrepts soil are occasionally subject to windthrow when the soil is wet and winds are strong. Because of the water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations in these areas. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock. Overuse can reduce sod type plant cover and cause gully erosion.

131 - Hangtown-Lithic Xerumbrepts complex, 15 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 5,800 to 7,800 feet. The average annual precipitation is 55 to 70 inches.

This unit is 45 percent Hangtown gravelly fine sandy loam and 40 percent Lithic Xerumbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Smokey soils and rock outcrop. Also included are small areas of a soil similar to Hangtown that has higher clay content in the subsoil. Included areas make up about 15 percent of the total acreage.

The Hangtown soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The upper 7 inches of the subsoil is dark brown very stony fine sandy loam. The lower 14 inches is brown very gravelly fine sandy loam. The upper 11 inches of the substratum is brown very cobbly fine sandy loam. The lower part is pale brown very stony fine sandy loam about 11 inches thick. Highly fractured metasedimentary rock is at a depth of 46 inches. In some areas the surface layer is sandy loam, fine sandy loam, or gravelly fine sandy loam.

Permeability of the Hangtown soil is moderately rapid. Available water capacity is low. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

The Lithic Xerumbrepts is shallow and excessively drained. It formed in material weathered from metamorphic rock. Typically, it has dark colors throughout the profile. Textures are sandy loam, fine sandy loam, or loam with 5 to 65 percent rock fragments.

Permeability of the Lithic Xerumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is very high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used for timber production. It is also used for summer range.

Much of this unit is not suited for timber production because of the areas of shallow Lithic Xerumbrepts . The Hangtown soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. Potential surface runoff from shallow soil areas may require modification in skid trail layout, erosion control measures, and ground cover requirements to prevent erosion from concentrated flows. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This unit is suited to only limited use as summer range because of steep slopes.

132 - Hangtown-Smokey complex, 5 to 30 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 5,800 to 7,900 feet. The average annual precipitation is 55 to 70 inches.

This unit is 50 percent Hangtown gravelly sandy loam and 35 percent Smokey gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless, Mieruf, Tallac, and Tinker soils. Also included are small areas of rock outcrop. Included areas make up about 15 percent of the total acreage.

The Hangtown soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The upper 7 inches of the subsoil is dark brown very stony fine sandy loam. The lower 14 inches is brown very gravelly fine sandy loam. The upper 11 inches of the substratum is brown very cobbly fine sandy loam. The lower part is pale brown very stony fine sandy loam about 11 inches thick. Highly fractured metasedimentary rock is at a depth of 46 inches. In some areas the surface layer is sandy loam, fine sandy loam, or gravelly fine sandy loam.

Permeability of the Hangtown soil is moderately rapid. Available water capacity is low. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

The Smokey soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is brown gravelly loam about 3 inches thick. The subsoil is light yellowish brown very gravelly loam about 13 inches thick. The substratum is brownish yellow very gravelly loam about 18 inches thick. Highly fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Smokey soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth, the low available water capacity, and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The production of forage is transitory and limited by the amount of competition from conifers.

133 - Hangtown-Smokey complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 5,800 to 7,900 feet. The average annual precipitation is 55 to 70 inches.

This unit is 45 percent Hangtown gravelly sandy loam and 40 percent Smokey gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless, Mieruf, Tallac, and Tinker soils. Also included are small areas of rock outcrop. Included areas make up about 15 percent of the total acreage.

The Hangtown soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is dark brown gravelly fine sandy loam about 3 inches thick. The upper 7 inches of the subsoil is dark brown very stony fine sandy loam. The lower 14 inches is brown very gravelly fine sandy loam. The upper 11 inches of the substratum is brown very cobbly fine sandy loam. The lower part is pale brown very stony fine sandy loam about 11 inches thick. Highly fractured metasedimentary rock is at a depth of 46 inches. In some areas the surface layer is sandy loam, fine sandy loam, or gravelly fine sandy loam.

Permeability of the Hangtown soil is moderately rapid. Available water capacity is low. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

The Smokey soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is brown gravelly loam about 3 inches thick. The subsoil is light yellowish brown very gravelly loam about 13 inches thick. The substratum is brownish yellow very gravelly loam about 18 inches thick. High fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Smokey soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This unit is suited to only limited use as summer range because of steep slopes.

134 - Hartless very gravelly loam, 5 to 30 percent slopes.

This deep or very deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, Mieruf, and Neuns soils and rock outcrop. Also included are small areas of a soil similar to Hartless that has an increase of clay in the subsoil, and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Hartless soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. The low available water capacity in the surface layer significantly reduces conifer seeding survival on south and southwest facing slopes. An adequate ground cover must be retained to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

135 - Hartless very gravelly loam, 30 to 50 percent slopes.

This deep or very deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,400 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, Mieruf and Neuns soils and rock outcrop. Also included are small areas of a soil similar to Hartless that has an increase of clay in the subsoil, and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Hartless soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer signeficantly reduces conifer seedling survival on south and southwest facing slopes. This soil is suited to only limited use as summer range because of steep slopes.

136 - Hartless-Mieruf very gravelly loams, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 50 percent Hartless very gravelly loam and 30 percent Mieruf very gravelly silt loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, and Neuns soils and rock outcrop. Also included are small areas of a soil similar to Mieruf that is 20 to 40 inches deep, a soil similar to Hartless that has an increase of clay in the subsoil, and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Mieruf soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

137 - Hartless-Mieruf very gravelly loams, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 60 percent Hartless very gravelly loam and 20 percent Mieruf very gravelly silt loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, and Neuns soils and rock outcrop. Also included are small areas of a soil similar to Mieruf that is 20 to 40 inches deep, a soil similar to Hartless that has an increase of clay in the subsoil, and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The Mieruf soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and south facing slopes. This unit is suited to only limited use as summer range because of steep slopes.

138 - Hartless-Mieruf very gravelly loams, 50 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 65 percent Hartless very gravelly loam and 15 percent Mieruf very gravelly silt loam. The percentage may vary from one area to another.

Included in this unit are small areas of Lithic Xerumbrepts and Neuns soils and rock outcrop. Also included is a soil similar to Mieruf that is 20 to 40 inches deep and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The Mieruf soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them seperately. This unit is used for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this unit are the very steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Cable yarding system are suited to this unit because they protect the surface soil from excessive disturbances. The use of ground base equipment for site prepartion is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity significantly reduces conifer seeding survival on south and southwest facing slopes. This unit is suited to only limited use as summer range because of the very steep slopes.

139 - Hartless-Neuns Complex, 15 to 30 percent slope.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 50 to 65 inches.

This unit is 50 percent Hartless very gravelly loam and 30 percent Neuns gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, and Mieruf soils and rock outcrop. Also included are small areas of a soil similar to Hartless that has an increase of clay in the subsoil and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity, maintaining the soil depth, and the hazard of erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

140 Hartless-Neuns Complex, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 50 to 65 inches.

This unit is 45 percent Hartless very gravelly loam and 35 percent Neuns gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Lithic Xerumbrepts, and Mieruf soils and rock outcrop. Also included is a soil similar to Hartless that has an increase of clay in the subsoil and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 7 inches thick. The subsoil is brown, strong brown, and reddish yellow very gravelly fine sandy loam about 57 inches thick. In some areas the surface layer is a very gravelly sandy loam, gravelly sandy loam, or gravelly loam.

Permeability of the Hartless soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for mixed conifers. The main concerns in producing and harvesting timber on this unit are the low available water capacity, the steep and very steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity significantly reduces conifer seeding survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedling difficult. This unit is suited to only limited use as summer range because of steep and very steep slopes.

141 Hartless Variant very gravelly sandy loam, 30 to 50 percent slopes.

This deep or very deep and well drained soil is on the sides of volcanic tabular ridges. It formed in material weathered from basaltic lahar. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,100 to 5,300 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is brown very gravelly sandy loam about 12 inches thick. The subsoil is light brown gravelly sandy loam about 9 inches thick. The upper 20 inches of the substratum is pale brown very cobbly sandy loam. The lower part to a depth of greater than 60 inches is pale brown loamy sand. In some areas the surface layer is gravelly, cobbly, or very cobbly sandy loam.

Included in this unit are small areas of Cohasset and Ziebright soils. Also included are small areas of a soil similar to Hartless Variant that has less than 35 percent rock fragments. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Hartless Variant soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Hartless Variant soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity

142 Holland loam, 5 to 30 percent slopes.

This very deep and well drained soil is on mountainsides and ridges. It formed in material weathered from granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,300 to 5,000 feet. The average annual precipitation is 50 to 60 inches.

Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Bighill, Chaix, Musick, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland that has up to 25 percent rock fragments. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Holland soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The production of forage is transitory and limited by the amount of competition from conifer.

143 Holland loam, 30 to 50 percent slopes.

This very deep and well drained soil is on mountainsides and ridges. It formed in material weathered from granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,800 to 4,800 feet. The average annual precipitation is 50 to 60 inches.

Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Bighill, Chaix, Musick, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland that has up to 25 percent rock fragments. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Holland soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. This soil is suited to only limited use as summer range because of steep slopes.

144 Holland-Bighill complex, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,300 to 4,600 feet. The average annual precipitation is 50 to 60 inches.

This unit is 50 percent Holland loam and 30 percent Bighill coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Chaix, Musick, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland that has up to 25 percent rock fragments. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Bighill soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 5 inches of the surface layer is dark grayish brown coarse sandy loam. The lower 12 inches is brown gravelly sandy loam. The subsoil is brown cobbly sandy loam about 15 inches thick. Weathered granitic rock is at a depth of 32 inches.

Permeability of the Bighill soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth, the low subsoil strength, and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The production of forage is transitory and limited by the amount of competition from conifers.

145 Holland-Bighill complex, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,100 to 4,600 feet. The average annual precipitation is 50 to 60 inches.

This unit is 45 percent Holland loam and 35 percent Bighill coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Chaix, Musick, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland that has up to 25 percent rock fragments. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The Bighill soil is moderately deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 5 inches of the surface layer is dark grayish brown coarse sandy loam. The lower 12 inches is brown gravelly sandy loam. The subsoil is brown cobbly sandy loam about 15 inches thick. Weathered granitic rock is at a depth of 32 inches.

Permeability of the Bighill soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep and very steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. This unit is suited to only limited use as summer range because of the steep and very steep slopes.

146 - Holland-Musick loams, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 40 to 60 inches.

This unit is 50 percent Holland loam and 30 percent Musick loam. The percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Chaix, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland and Musick that has up to 25 percent rock fragments throughout the profile. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Musick soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 6 inches thick. The upper 18 inches of the subsoil is yellowish red clay loam. The lower 28 inches is red and yellowish red sandy clay loam. The upper 16 inches of the substratum is yellowish red gravelly sandy clay loam. The lower part to a depth of 71 inches is strong brown gravelly sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Musick soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The production of forage is transitory and limited by the amount of competition from conifers.

147 - Holland-Musick loams, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 40 to 60 inches.

This unit is 60 percent Holland loam and 20 percent Musick loam. The percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Chaix, and Pilliken soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep and a soil similar to Holland and Musick that has up to 25 percent rock fragments throughout the profile. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The Musick soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 6 inches thick. The upper 18 inches of the subsoil is yellowish red clay loam. The lower 28 inches is red and yellowish red sandy clay loam. The upper 16 inches of the substratum is yellowish red gravelly sandy clay loam. The lower part to a depth of 71 inches is strong brown gravelly sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Musick soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and the low subsoil strength. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars of ground cover. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This unit is suited to only limited use as summer range because of steep slopes.

148 - Holland-Pilliken association, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,500 to 6,000 feet. The average annual precipitation is 40 to 65 inches.

This unit is 50 percent Holland loam and 30 percent Pilliken coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Musick soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The production of forage is transitory and limited by the amount of competition from conifers.

149 - Holland-Pilliken association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,500 to 6,000 feet. The average annual precipitation is 40 to 65 inches.

This unit is 45 percent Holland loam and 35 percent Pilliken coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Musick soils. Also included are small areas of a soil similar to Holland that is 20 to 60 inches deep. Included areas make up about 20 percent of the total acreage.

The Holland soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is brown loam about 8 inches thick. The upper 9 inches of the subsoil is strong brown sandy clay loam. The lower 39 inches is reddish yellow sandy clay loam. The substratum to a depth of 64 inches is yellowish brown and brownish yellow sandy loam. In some areas the surface layer is sandy loam.

Permeability of the Holland soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and the low subsoil strength. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy period. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This unit is suited to only limited use as summer range because of steep slopes.

150 - Jocal loam, 5 to 30 percent slopes.

This deep or very deep and well drained soil is on mountainsides and ridgetops. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 5,500 feet. The average annual precipitation is 40 to 60 inches.

Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Hartless, Mariposa, Mieruf, Neuns, and Sites soils. Included areas make up about 20 perent of the total acreage. The percentage may vary from one area to another.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Jocal soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the low subsoil strength and the hazard or erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatments for dust abatement during dry periods to reduce road surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competition from conifers.

151 - Jocal loam, 30 to 50 percent slopes.

This deep or very deep and well drained soil is on mountainsides and ridgetops. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,000 to 5,500 feet. The average annual precipitation is 40 to 60 inches.

Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Hartless, Mariposa, Mieruf, Neuns, and Sites soils. Included areas make up about 20 perent of the total acreage. The percentage may vary from one area to another.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Jocal soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

152 - Jocal-Hartless complex, 5 to 30 percent slopes.

This map unit is on mountainsides and ridgetops. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 45 percent Jocal loam and 30 percent Hartless extremely gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Mieruf and Neuns soils. Included areas make up about 25 percent of the total acreage.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 5 inches of the surface layer is very dark grayish brown extremely gravelly loam. The lower 6 inches is dark yellowish brown extremely gravelly fine sandy loam. The subsoil is yellowish red and strong brown very cobbly sandy clay loam about 29 inches thick. The substratum is reddish yellow cobbly sandy clay loam about 7 inches thick. Fractured metasedimentary rock is at a depth of 47 inches.

Permeability of the Hartless soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength, the low available water capacity, and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock framents in the surface layer in some areas makes planting seedlings difficult. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competition from conifers.

153 - Jocal-Hartless complex, 30 to 50 percent slopes.

This map unit is on mountainsides and ridgetops. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 40 percent Jocal loam and 35 percent Hartless extremely gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Lithic Xerumbrepts, Mieruf, and Neuns soils. Included areas make up about 25 percent of the total acreage.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The Hartless soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 5 inches of the surface layer is very dark grayish brown extremely gravelly loam. The lower 6 inches is dark yellowish brown extremely gravelly fine sandy loam. The subsoil is yellowish red and strong brown very cobbly sandy clay loam about 29 inches thick. The substratum is reddish yellow cobbly sandy clay loam about 7 inches thick. Fractured metasedimentary rock is at a depth of 47 inches.

Permeability of the Hartless soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to intensive production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, the low available water capacity, and the low subsoil strength. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

154 - Jocal-Mariposa-Umbrepts association, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on the Jocal and Mariposa components of this unit. The Maple-Alder-Dogwood series typically occurs on the Umbrepts component. Elevation is 2,000 to 5,000 feet. The average annual precipitation is 40 to 60 inches.

This unit is 40 percent Jocal loam, 35 percent Mariposa gravelly silt loam, and 15 percent Umbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Maymen soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The Mariposa soil is shallow to moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is high.

The Umbrepts is a somewhat poorly drained or moderately well drained soils that formed in alluvial material along drainages. Typically, it has dark surface layers. The profile has stratified layers with textures ranging from clays to loams with 50 to 70 percent rock fragments.

Permeability of the Umbrepts is slow or moderately slow and mottles are common in the lower subsoil horizons. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Jocal soil is well suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Following road construction and timber harvest activities, road failures and landslides may occur. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. This soil is suited to only limited use as summer range because of steep and very steep slopes.

The Mariposa soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect

the soil surface from erosion. Because soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. Following road construction and timber harvest activities, road failures and landslides may occur. This soil is suited to only limited use as summer range because of steep and very steep slopes.

The Umbrepts is not suited to the production of timber because of poor drainage conditions. The main concerns in grazing animals on this soil are the high seasonal water table and the stability of stream banks. Because the rooting depth is restricted by a seasonally high water table, trees growing in soils bordering the Umbrepts are occasionally subject to windthrow when the soil is wet and winds are strong. Because of its water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations in these areas. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock.

155 Jocal-Sites loams, 5 to 30 percent slopes.

This map unit is on mountainsides and ridgetops. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,400 to 3,800 feet. The average annual precipitation is 45 to 60 inches.

This unit is 50 percent Jocal loam and 30 percent Sites loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless and Mariposa soils. Included areas make up about 20 percent of the total acreage.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Sites soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the surface layer is reddish brown loam about 3 inches thick. The subsoil to a depth of 60 inches is red clay loam and clay. In some areas the organic matter content is less than is defined for the series.

Permeability of the Sites soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competition from conifers.

156 - Ledford sandy loam, 15 to 50 percent slopes.

This deep, somewhat excessively drained soil is on mountainsides. It formed in material weathered from granitic rock. The Red Fir series typically occurs on this unit. Elevation is 5,600 to 6,400 feet. The average annual precipitation is 55 to 70 inches.

Typically, the upper 2 inches of the surface layer is dark brown sandy loam. The lower part is dark brown and brown coarse sandy loam about 10 inches thick. The subsoil is yellowish brown coarse sandy loam about 25 inches thick. The substratum is light yellowish brown coarse sandy loam about 10 inches thick. Highly weathered granitic rock is at a depth of 47 inches.

Included in this unit are small areas of Gerle, Lithic Cryumbrepts, Lithic Xerumbrepts, Lumberly, Notned, and Umbrepts soils. Also included are small areas of rock outcrop. Included areas make up about 15 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Ledford soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

This soil is used mainly for timber production. It is also used for summer range.

The Ledford soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

157 - Ledford-Notned complex, 5 to 30 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 55 percent Ledford sandy loam and 35 percent Notned bouldery coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts, wet soils and rock outcrop. Also included are small areas of a soil similar to Ledford that has sandy textures throughout and a thin dark surface horizon. Included areas make up about 10 percent of the total acreage.

The Ledford soil is deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the upper 2 inches of the surface layer is dark brown sandy loam. The lower part is dark brown and brown coarse sandy loam about 10 inches thick. The subsoil is yellowish brown coarse sandy loam about 25 inches thick. The substratum is light yellowish brown coarse sandy loam about 10 inches thick. Highly weathered granitic rock is at a depth of 47 inches.

Permeability of the Ledford soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is greater than 60 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

158 - Ledford-Notned complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 60 percent Ledford sandy loam and 30 percent Notned bouldery coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts, wet soils and rock outcrop. Also included are small areas of a soil similar to Ledford that has sandy textures throughout and a thin dark surface horizon. Included areas make up about 10 percent of the total acreage.

The Ledford soil is deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the upper 2 inches of the surface layer is dark brown sandy loam. The lower part is dark brown and brown coarse sandy loam about 10 inches thick. The subsoil is yellowish brown coarse sandy loam about 25 inches thick. The substratum is light yellowish brown coarse sandy loam about 10 inches thick. Highly weathered granitic rock is at a depth of 47 inches.

Permeability of the Ledford soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

159 - Ledmount-Rock outcrop association, 2 to 30 percent slopes.

This map unit is on the tops and sides of volcanic tabular ridges. The Greenleaf Manzanita series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 55 inches.

This unit is 50 percent Ledmount cobbly sandy loam and 30 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of McCarthy soils. Also included are small areas of a soil similar to Ledmount that has an eroded surface horizon and is less than 10 inches deep. Included areas make up about 20 percent of the total acreage.

The Ledmount soil is shallow and somewhat excessively drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark grayish brown and dark brown cobbly sandy loam about 15 inches thick over fractured, slightly weathered andesitic lahar.

Permeability of the Ledmount soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is moderate.

Rock outcrop consists of areas of hard andesitic lahar, commonly called lava cap. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The components of this unit are so intricately intermingled that it is not practical to manage them separately.

This unit is not suited to the production of timber. The highest growth rate is less than 20 cubic feet per acre per year.

160 - Ledmount-Rock outcrop association, 30 to 75 percent slopes.

This map unit is on the tops and sides of volcanic tabular ridges. The Greenleaf Manzanita series typically occurs on this unit. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 45 to 55 inches.

This unit is 45 percent Ledmount cobbly sandy loam and 35 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of McCarthy soils. Also included are small areas of a soil similar to Ledmount that has an eroded surface horizon and is less than 10 inches deep. Included areas make up about 20 percent of the total acreage.

The Ledmount soil is shallow and somewhat excessively drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark grayish brown cobbly and dark brown sandy loam about 15 inches thick over fractured, slightly weathered andesitic lahar.

Permeability of the Ledmount soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is high.

Rock outcrop consists of areas of hard andesitic lahar, commonly called lava cap. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The components of this unit are so intricately intermingled that it is not practical to manage them separately.

This unit is not suited to the production of timber. The highest growth rate is less than 20 cubic feet per acre per year.

161 - Lithic Cryumbrepts, 15 to 75 percent slopes.

This shallow, excessively drained soil is on ridgetops and mountainsides. It formed in material weathered from andesitic lahar. The Mule Ears series typically occurs on this unit. Areas of the Red Fir, Alder, Lodgepole Pine, and Mountain Hemlock series are also found throughout the unit. Elevation is 7,000 to 10,000 feet. The average annual precipitaion is 50 to 70 inches.

Typically, it is sandy loam, fine sandy loam, and loam with coarse fragments ranging from 20 to 80 percent. The surface horizon is dark, has low bulk density and has some amorphous clay.

Included in this unit are small areas of Andic Cryumbrepts. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is is 4 to 20 inches. The maximum erosion hazard is very high.

This unit is used mainly for recreation in Wilderness Areas. It is also used as summer range.

The Lithic Cryumbrepts is used mainly for recreation and summer range. The main concerns in management on this soil are the steep and very steep slopes, the high runoff potential, and the hazard of erosion. This soil is not forested and is not suited to the production of timber because of the shallow depth.

162 - Lithic Cryumbrepts-Waca association, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mountain Whitethorn series typically occurs on the Lithic Cryumbrepts component of this unit. The Red Fir series typically occurs on the Waca component. Elevation is 6,000 to 8,500 feet. Average annual precipitation is 50 to 65 inches.

The unit is 55 percent Lithic Cryumbrepts and 35 percent Waca cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Windy soils. Also included are small areas of rock outcrop. Included areas make up about 15 percent of the total acreage.

The Lithic Cryumbrepts is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, and loam with rock fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density and has some amorphous clay.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is is 4 to 20 inches. The maximum erosion hazard is moderate.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This unit is used for limited timber production. It is also used for summer range.

The Lithic Cryumbrepts is used mainly for summer range. The main concerns in management on this soil are the high runoff potential, and the hazard of erosion. This soil is not forested and is not suited to the production of timber because of the shallow depth.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are maintaining the soil depth and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Potential surface runoff from the Lithic Cryumbrepts areas may require modification in skid trail layout, erosion control measures and ground cover requirements to prevent erosion from concentrated flows. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

163 - Lithic Cryumbrepts-Waca association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mountain Whitethorn series typically occurs on the Lithic Cryumbrepts component of this unit. The Red Fir series typically occurs on the Waca component. Elevation is 6,000 to 8,500 feet. Average annual precipitation is 50 to 65 inches.

The unit is 55 percent Lithic Cryumbrepts and 35 percent Waca cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Windy soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Lithic Cryumbrepts is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, and loam with rock fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density and has some amorphous clay.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is is 4 to 20 inches. The maximum erosion hazard is very high.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used for limited timber production. It is also used for summer range.

The Lithic Cryumbrepts soil is used mainly for summer range. The main concerns in management on this soil are the steep slopes, the high runoff potential, and the hazard of erosion. This soil is not forested and is not suited to the production of timber because of the shallow depth.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Potential surface runoff from the Lithic Cryumbrepts areas may require modification in skid trail layout, erosion control measures and ground cover requirements to prevent erosion from concentrated flows. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

164 - Lithic Xerumbrepts-Rock outcrop complex, 15 to 75 percent.

This map unit is on mountainsides. The Mountain Whitethorn series typically occurs on this unit. Elevation is 4,000 to 8,500 feet. The average annual precipitation is 50 to 70 inches.

This unit is 40 percent Lithic Xerumbrepts and 40 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Bighill, Chaix, Hartless, Holland, Ledford, Lumberly, and Neuns soils. Also included are small areas of slopes greater than 75 percent in the Rubicon Drainage. Included areas make up about 20 percent of the total acreage.

The Lithic Xerumbrepts is shallow and excessively drained. It formed in material weathered from granitic or metamorphic rock. Typically, it has dark colors throughout the profile. Textures are sand, loamy sand, sandy loam, fine sandy loam, or loam with 5 to 65 percent rock fragments.

Permeability of the Lithic Xerumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is very high.

Rock outcrop occurs as isolated outcroppings and massive exposures of granitic or metamorphic rock. Runoff is very rapid. Large quanities of water may concentrate of soils downslope, which increase the erosion hazard of the soils.

The components of this unit are so intricately intermingled that it is not practical to manage them seperately.

This unit is used mainly for summer range.

The Lithic Xerumbrepts soils are used mainly for recreation and summer range. The main concerns in management on the soil are steep and very steep slopes, the high runoff potential, and the hazard of erosion. This soil is not forested and is not suited to the production of timber because of the shallow depth.

165 - Lumberly gravelly coarse sandy loam, 5 to 30 percent slopes.

This moderately deep and well drained soil is on mountainsides. It formed in material weathered from granitic rock. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is grayish brown and yellowish brown gravelly coarse sandy loam about 10 inches thick. The subsoil is light brown and reddish yellow gravelly coarse sandy loam about 23 inches thick. Decomposed granitic rock is a depth of 33 inches. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Ledford soil and Lithic Xerumbrepts. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Lumberly soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This soil is used mainly for timber production. It is also used for summer range.

The Lumberly soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are maintaining the soil depth and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

166 - Lumberly gravelly coarse sandy loam, 30 to 50 percent slopes.

This moderately deep and well drained soil is on mountainsides. It formed in material weathered from granitic rock. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is grayish brown and yellowish brown gravelly coarse sandy loam about 10 inches thick. The subsoil is light brown and reddish yellow gravelly coarse sandy loam about 23 inches thick. Decomposed granitic rock is a depth of 33 inches. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Ledford soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Lumberly soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This soil is used mainly for timber production. It is also used for summer range.

The Lumberly soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layer. An adequate ground cover must be retained to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of the steep slopes.

167 - Mariposa gravelly silt loam, 5 to 30 percent slopes.

This shallow to moderately deep and well drained soil is on mountainsides and ridgetops. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,400 to 5,600 feet. The average annual precipitation is 50 to 60 inches.

Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Jocal soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Mariposa soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the available water capacity, maintaining the soil depth, and the hazard of erosion. Because soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competition from conifers.

168 - Mariposa gravelly silt loam, 30 to 50 percent slopes.

This shallow to moderately deep and well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer- Pine series typically occurs on this unit. Elevation is 3,200 to 5,200 feet. The average annual precipitation is 50 to 60 inches.

Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Included in this unit are small areas of Sites soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Mariposa soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity, the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Because the soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. This soil is suited to only limited use as summer range because of steep slopes.

169 - Mariposa-Jocal complex, 5 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer - Pine series typically occurs on this unit. Elevation is 2,500 to 5,500 feet. The average annual precipitation is 45 to 60 inches.

This unit is 50 percent Mariposa gravelly silt loam and 40 percent Jocal loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless, Mieruf, Neuns, and Sites soils, and rock outcrop. Also included are small areas of soils similar to Mariposa and Jocal that have greater than 35 percent rock fragments in the subsoil. Included areas make up about 10 percent of the total acreage.

The Mariposa soil is shallow to moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is moderate.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low subsoil strength, the low available water capacity, maintaining the soil depth, and the hazard of erosion. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Because soil depth varies, tree planting may be difficult and seedling survival may be low where the soil is shallow. The production of forage is tansitory and limited by the amount of competition from conifers.

170 - Mariposa-Jocal complex, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 2,500 to 5,500 feet. The average annual precipitation is 45 to 60 inches.

This unit is 55 percent Mariposa gravelly silt loam and 30 percent Jocal loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless, Mieruf, Neuns, and Sites soils, and rock outcrop. Also included are small areas of soils similar to Mariposa and Jocal that have greater than 35 percent rock fragments. Included areas make up about 15 percent of the total acreage.

The Mariposa soil is shallow to moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is high.

The Jocal soil is deep or very deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the upper 4 inches of the surface layer is brown loam. The lower part is strong brown silt loam about 11 inches thick. The subsoil is reddish yellow silty clay loam about 30 inches thick. The substratum to a depth of 60 inches or more is reddish yellow sandy clay loam. In some areas the surface layer is gravelly loam.

Permeability of the Jocal soil is moderately slow. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Because soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. Restricted use of ground based equipment under wet soil conditions may be necessary because of the low subsoil strength. Unsurfaced roads are soft and slippery when wet and can be impassible during rainy periods. This unit is suited to only limited use as summer range because of steep and very steep slopes.

171 - Mariposa-Maymen complex, 2 to 30 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on the Mariposa component of this unit. The Canyon Live Oak series typically occurs on the Maymen component of this unit. Elevation is 2,500 to 5,500 feet. The average annual precipitation is 45 to 60 inches.

This unit is 50 percent Mariposa gravelly silt loam and 30 percent Maymen gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Hartless, and Neuns soils and rock outcrop. Also included are small areas of colluvial soils similar to Maymen that have greater than 35 percent rock fragments in the subsoil. Included areas make up about 20 percent of the total acreage.

The Mariposa soil is shallow to moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is moderate.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is light brown gravelly loam about 9 inches thick. Partly fractured and uptilted metasedimentary rock is at a depth of 13 inches. In some areas the surface layer is sandy loam.

Permeability of the Maymen soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them seperately. This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is poorly suited to the production of timber because of the shallow Maymen soils. The Mariposa soil is suited to the production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth, the low available water capacity, and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the
surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Potential surface runoff from Maymen soil areas may require modifications in skid trail layout, erosion control measures and ground cover requirements to prevent erosion from concentrated flows. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Because soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competition from conifers.

172 - Mariposa-Maymen complex, 30 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on the Mariposa component of this unit. The Canyon Live Oak series typically occurs on the Maymen component of this unit. Elevation is 2,500 to 5,500 feet. The average annual precipitation is 45 to 60 inches.

This unit is 40 percent Mariposa gravelly silt loam and 40 percent Maymen gravelly loam. The percentage may vary from one area to another.

Included in this unit are small areas of Jocal, Hartless, and Neuns soils and rock outcrop. Also included are small areas of colluvial soils similar to Maymen that have greater than 35 percent rock fragments in the subsoil. Included areas make up about 20 percent of the total acreage.

The Mariposa soil is shallow to moderately deep and well drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is strong brown gravelly silt loam about 5 inches thick. The subsoil is reddish yellow gravelly silty clay loam about 25 inches thick. Highly fractured and uptilted metasedimentary rock is at a depth of 30 inches. In some areas the surface layer is loam.

Permeability of the Mariposa soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 35 inches. The maximum erosion hazard is high.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is light brown gravelly loam about 9 inches thick. Partly fractured and uptilted metasedimentary rock is at a depth of 13 inches. In some areas the surface layer is sandy loam.

Permeability of the Maymen soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them seperately. This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is poorly suited to the production of timber because of the shallow Maymen soils . The Mariposa soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Potential surface runoff from Maymen soil areas may require modications in skid trail layout, erosion control measures,and ground cover requirements to prevent erosion from concentrated flows. Cable yarding system are suited to this unit because they protect the surface soil from excessive disturbances. The use of ground base equipment for site preparation is not practical because of the the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Because soil depth varies, tree planting may be difficult and seedling survival may be low when the soil is shallow. This unit is suited to only limited use as summer range because of the steep and very steep slopes.

173 - Maymen-Rock outcrop association, 30 to 75 percent slopes.

This map unit is on mountainsides. The Canyon Live Oak series typically occurs on this unit. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 50 percent Maymen gravelly loam and 30 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Mariposa soils and Neuns soils. Included areas make up about 20 percent of the total acreage.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is light brown gravelly loam about 9 inches thick. Partly fractured and uptilted metasedimentary rock is at a depth of 13 inches. In some areas the surface layer is sandy loam.

Permeability of the Maymen soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is high.

Rock outcrop occurs as scattered areas of metasedimentary rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

Most of this unit is poorly suited to the production of timber because of the shallow soils and rock outcrop. The Maymen soil is poorly suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from less than 20 to 49 cubic feet per acre for ponderosa pine. Areas of rock outcrop can reduce yield by about 30 percent. The main concerns in producing and harvesting timber on this unit are the steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. The use of ground based equipment for site preparation is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This unit is suited to only limited use as summer range because of steep and very steep slopes.

174 - Maymen-Rock outcrop association, 75 to 100 percent slopes.

This map unit is on mountainsides. The Canyon Live Oak series typically occurs on this unit. Elevation is 2,500 to 5,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 45 percent Maymen gravelly loam and 35 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Mariposa and Neuns soils. Included areas make up about 20 percent of the total acreage.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from metasedimentary rock. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. The subsoil is light brown gravelly loam about 9 inches thick. Partly fractured and uptilted metasedimentary rock is at a depth of 13 inches. In some areas the surface layer is sandy loam.

Permeability of the Maymen soil is moderate. Available water capacity is very low to low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is very high.

Rock outcrop occurs as scattered areas of metasedimentary rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

This unit is not suited to the production of timber or use as summer range.

175 - McCarthy gravelly sandy loam, 2 to 30 percent slopes.

This moderately deep, well drained soil is on mountainsides. It is formed in material weathered from andesitic lahar. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,600 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Crozier and Ledmount soils. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is deeper than 40 inches. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The McCarthy soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth and potential erosion hazard. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

176 - McCarthy gravelly sandy loam, 30 to 50 percent slopes.

This moderately deep, well drained soil is on mountainsides. It is formed in material weathered from andesitic lahar. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 3,800 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Crozier and Ledmount soils. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is deeper than 40 inches. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The McCarthy soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles and stones in the soil profile. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. This soil is suited to only limited use as summer range because of steep slopes.

177 - McCarthy-Ledmount association, 2 to 30 percent slopes.

This map unit is on tops and sides of volcanic tabular ridges. The Mixed Conifer-Pine series typically occurs on the McCarthy component of this unit. The Greenleaf Manzanita series typically occurs on the Ledmount component of this unit. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 60 percent McCarthy gravelly sandy loam and 30 percent Ledmount cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Crozier soils and rock outcrop. Also included are small areas of a soil similar to Ledmount that is less than 10 inches deep. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is deeper than 40 inches. Included areas make up about 10 percent of the total acreage.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Ledmount soil is shallow and somewhat excessively drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark grayish brown and dark brown cobbly sandy loam about 15 inches thick over fractured, slightly weathered andesitic lahar.

Permeability of the Ledmount soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is moderate.

This unit is used for limited timber production. It is also used for summer range.

The McCarthy soil is suited to production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are maintaining the soil depth and the hazard of erosion. When these soils are situated in a position where water runoff concentrates from shallow soil areas, skid trail layout, erosion control measures, and ground cover requirements may need to be modified. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads requiremore than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

The Ledmount soil is not suited to production of timber. The highest growth rate on the Ledmount soil is less than 20 cubic feet per acre per year.

178 - McCarthy-Ledmount association, 30 to 75 percent slopes.

This map unit is on tops and sides of volcanic tabular ridges. The Mixed Conifer-Pine series typically occurs on the McCarthy component of this unit. The Greenleaf Manzanita series typically occurs on the Ledmount component of this unit. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 55 percent McCarthy gravelly sandy loam and 35 percent Ledmount cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Crozier soils and rock outcrop. Also included are small areas of a soil similar to Ledmount that is less than 10 inches deep. Also included are small areas of a soil similar to McCarthy that has less than 35 percent coarse fragments in the subsoil and a soil similar to McCarthy that is deeper than 40 inches. Included areas make up about 10 percent of the total acreage.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is brown very gravelly loam about 21 inches thick. Weathered andesitic lahar is at a depth of 26 inches. In some areas the surface layer is gravelly loam.

Permeability of the McCarthy soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Ledmount soil is shallow and somewhat excessively drained. It formed in material weathered from andesitic lahar. Typically, the surface layer is dark grayish brown and dark brown cobbly sandy loam about 15 inches thick over fractured, slightly weathered andesitic lahar.

Permeability of the Ledmount soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is high.

This unit is used for limited timber production. It is also used for summer range.

The McCarthy soil is suited to production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep and very steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles and stones in the soil profile. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. This soil is suited to only limited use as summer range because of steep and very steep slopes.

The Ledmount soil is not suited to the production of timber. The highest growth rate on the Ledmount soil is less than 20 cubic feet per acre per year.

179 - McCarthy-Rock outcrop complex, 15 to 75 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 45 to 60 inches.

This unit is 65 percent McCarthy gravelly loam and 25 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Ledmount soils. Included areas make up about 10 percent of the total acreage.

The McCarthy soil is moderately deep and well drained. It formed in material weathered from rhyolite. Typically, the surface layer is brown gravelly loam about 11 inches thick. The subsoil is brown very cobbly loam about 13 inches thick. Slightly weathered and fractured rhyolitic tuff is at a depth of 24 inches.

Permeability of the McCarthy soil is moderately rapid. Available water holding capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

Rock outcrop consists of rhyolitic tuff breccia. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on soils downslope, which increase the erosion hazard of the soil.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used for timber production. It is also used for summer range.

Much of this unit is not suited to production of timber because of the areas of rock outcrop. The McCarthy soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Potential surface runoff from rock outcrop areas may require modification in skid trail layout, erosion control measures and ground cover requirements to prevent erosion from concentrated flows. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Following road construction and timber harvest activities, road failures and landslides may occur. This unit is suited to only limited use as summer range because of steep and very steep slopes.

180 - Mieruf very gravelly loam, 5 to 30 percent slopes.

This deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Included in this unit are small areas of Hartless, Jocal, Neuns soils and Lithic Xerumbrepts. Also included is a soil similar to Mieruf that is 20 to 40 inches deep and a soil similar to Mieruf with a dark surface. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

This soil is used mainly for timber production. It is also used for summer range.

The Mieruf soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concern in producing and harvesting timber on this soil is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competion from conifers.

181 Mieruf very gravelly loam, 30 to 50 percent slopes.

This deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Included in this unit are small areas of Hartless, Jocal, Neuns soils and Lithic Xerumbrepts. Also included is a soil similar to Mieruf that is 20 to 40 inches deep and a soil similar to Mieruf with a dark surface. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Mieruf soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

182 - Neuns gravelly loam, 15 to 30 percent slopes.

This moderately deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer- Pine series typically occurs on this unit. Elevation is 4,200 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Included in this unit are small areas of Jocal, Mariposa, Mieruf soils, Lithic Xerumbrepts, and rock outcrop. Also included are small areas of a soil similar to Hartless that has an increase of clay in the subsoil. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Neuns soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth, the low available water capacity, and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. The production of forage is transitory and limited by the amount of competion from conifers.

183 - Neuns gravelly loam, 30 to 50 percent slopes.

This moderately deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer- Pine series typically occurs on this unit. Elevation is 4,200 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Included in this unit are small areas of Jocal, Mariposa, and Mieruf soils, Lithic Xerumbrepts, and rock outcrop. Also included are small area of a soil similar to Hartless that has an increase of clay in the subsoil. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Neuns soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for mixed conifers. The main concerns in producing and harvesting timber on this soil are the low available water capacity, maintaining the soil depth, the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layer. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling surival on south and southwest facing slopes. This soil is suited to only limited use as summer range because of steep slopes.

184 - Neuns gravelly loam, 50 to 75 percent slopes.

This moderately deep, well drained soil is on mountainsides. It formed in material weathered from metasedimentary rock. The Mixed Conifer- Pine series typically occurs on this unit. Elevation is 4,200 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Included in this unit are small areas of Mariposa soils, Lithic Xerumbrepts, and rock outcrop. Also included are small areas of a soil similar to Hartless that has an increase of clay in the subsoil. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Neuns soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for mixed conifers. The main concerns in producing and harvesting timber on this soil are the very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Cable yarding system are suited to this soil because they protect the surface soil from excessive disturbances. The use of ground base equipment for site prepartion is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This soil is suited to only limited use as summer range because of very steep slopes.

185 - Neuns-Lithic Xerumbrepts-Rock outcrop association, 50 to 100 percent slopes.

This map unit is in canyons. The Mountain Whitethorn series typically occurs on this unit. Elevation is 2,400 to 4,000 feet. The average annual precipitation is 50 to 60 inches.

This unit is 40 percent Neuns gravelly loam, 30 percent Lithic Xerumbrepts and 20 percent Rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless and Mieruf soils. Included areas make up about 10 percent of the total acreage.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. The Neuns component is on slopes of 50 to 80 percent. Typically, the upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Lithic Xerumbrepts is shallow and excessively drained. It formed in material weathered from metamorphic rock. The Lithic Xerumbrepts component is on slopes of 50 to 100 percent. It has dark colors throughout the profile. Textures are sand, loamy sand, sandy loam, fine sandy loam, or loam with 5 to 65 percent rock fragments.

Permeability of the Lithic Xerumbrepts is moderately rapid or rapid. Available water capacity (AWC) is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is very high.

Rock outcrop occurs as isolated outcroppings and massive exposures of granitic or metamorphic rock. Runoff is very rapid. Large quanities of water may concentrate of soils downslope, which increases the erosion hazard of the soils.

This unit is used for limited timber production.

Most of this unit is not suited to the production of timber because of the shallow Lithic Xerumbrepts and areas of rock outcrop. The Nuens soil is suited to production of timber. The culumination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for mixed conifers. The main concerns in producing and harvesting timber on this soil are the very steep and extremely steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When these soils are situated in position where water runoff concentrates from shallow soils and rock outcrop, skid trail layout, erosion control measures, and ground cover requirements may need to be modified. Cable yarding system are suited to this soil because they protect the surface soil from excessive disturbances. The use of ground base equipment for site prepartion is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This unit is not suited to use as summer range because of the very steep and extremely steep slopes.

186 - Neuns-Mieruf Complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 50 to 65 inches.

This unit is 50 percent Neuns gravelly loam and 30 percent Mieruf very gravelly silt loam. The percentage may vary from one area to another.

Included in this unit are small areas of Hartless, and Mariposa soils, Lithic Xerumbrepts, and rock outcrop. Also included is a soil similar to Mieruf that is 20 to 40 inches deep and a soil similar to Hartless that has a dark surface horizon. Included areas make up about 20 percent of the total acreage.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metasedimentary rock. The upper 3 inches of the surface layer is yellowish brown gravelly loam. The lower 9 inches is strong brown very cobbly sandy loam. The subsoil is reddish yellow very cobbly sandy loam about 22 inches thick. Hard, fractured metasedimentary rock is at a depth of 34 inches.

Permeability of the Neuns soil is moderate. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Mieruf soil is deep and well drained. It formed in material weathered from metasedimentary rock. Typically the surface layer is dark brown very gravelly loam about 6 inches thick. The upper 19 inches of the subsoil is brown and reddish yellow gravelly loam. The lower 25 inches is reddish yellow loam. Weathered, fractured metasedimentary rock is at a depth of 50 inches. In some areas the surface layer is gravelly sandy loam.

Permeability of the Mieruf soil is moderate. Available water capacity is moderate to high. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for mixed conifer. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survial on south and southwest facing slopes. This unit is suited to only limited use as summer range because of steep slopes.

187 - Notned-Gerle complex, 30 to 50 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,600 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

This unit is 45 percent Notned bouldery coarse sandy loam and 30 percent Gerle sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Dome, Dome Variant, Ledford, Pilliken, Tallac, and Zeibright soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop. Included areas make up about 25 percent of the total acreage.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or commonly loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is greater than 60 inches. The maximum erosion hazard is high.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is greater than 60 inches. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas ma

188 - Notned-Ledford association, 5 to 30 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 55 percent Notned bouldery coarse sandy loam and 35 percent Ledford sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of a soil similar to Ledford that has a thin surface horizon. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

The Ledford soil is deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the upper 2 inches of the surface layer is dark brown sandy loam. The lower part is dark brown and brown coarse sandy loam about 10 inches thick. The subsoil is yellowish brown coarse sandy loam about 25 inches thick. The substratum is light yellowish brown coarse sandy loam about 10 inches thick. Highly weathered granite is at a depth of 47 inches.

Permeability of the Ledford soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Notned soil is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

The Ledford soil is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concern in producing and harvesting timber on this soil is potential erosion hazard. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition to conifer production.

189 - Notned-Ledford association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 60 percent Notned bouldery coarse sandy loam and 30 percent Ledford sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of a soil similar to Ledford that has a thin surface horizon. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

The Ledford soil is deep and somewhat excessively drained. It formed in material weathered from granitic rock. Typically, the upper 2 inches of the surface layer is dark brown sandy loam. The lower part is dark brown and brown coarse sandy loam about 10 inches thick. The subsoil is yellowish brown coarse sandy loam about 25 inches thick. The substratum is light yellowish brown coarse sandy loam about 10 inches thick. Highly weathered granitic rock is at a depth of 47 inches.

Permeability of the Ledford soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Notned soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the low available water capacity, the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This soil is suited to only limited use as summer range because of steep slopes.

The Ledford soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 224 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Steep yarding paths, skid trails, and fire breaks are subject to rill an

190 - Notned-Rock outcrop association, 5 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 7,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 55 percent Notned bouldery coarse sandy loam and 30 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Gerle, Ledford soils and Lithic Xerumbrepts. Included areas make up about 15 percent of the total acreage.

The Notned soil is very deep and well drained. It formed in material weathered from granitic rock. Typically, the upper 4 inches of the surface layer is dark brown bouldery coarse sandy loam. The lower 12 inches is dark yellowish brown cobbly coarse sandy loam. The subsoil is brown and yellowish brown very cobbly coarse sandy loam about 30 inches thick. The substratum to a depth of 62 inches is brownish yellow, very pale brown, and yellow very cobbly coarse sandy loam. In some areas the surface layer is coarse sandy loam or loamy sand.

Permeability of the Notned soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. The maximum erosion hazard is high.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is very rapid. Large quanities of water may concentrate on soils downslope, which increase the erosion hazard of the soils.

This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is not suited to the production of timber because of the areas of rock outcrop. The Notned soil is suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the presence of Rock outcrop, the low available water capacity, the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. Rock outcrop on the surface hinders harvesting operations and can cause breakage of timber when felled. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This soil is suited to only limited use as summer range because of steep slopes.

191 - Orthents-Rock outcrop association, 10 to 40 percent slopes.

This map unit is on mountainsides. The Mountain Hemlock series typically occurs on this unit. Elevation is 6,400 to 8,800 feet. The average annual precipitation is 45 to 55 inches.

This unit is 60 percent Orthents and 15 percent rock outcrop. The percentage may vary from one area to another.

Included in this map unit are small areas of Cryumbrepts and Xerumbrepts. Included areas make up 25 percent of the total acreage.

The Orthents are shallow or moderately deep and well drained. It formed in material weathered from granitic rock. Textures are loamy sand, coarse sandy loam, or sandy loam with 0 to 60 percent rock fragments.

Permeability of the Orthents are moderate or rapid. Available water capacity is very low. Effective rooting depth is 15 to 40 inches. The maximum erosion hazard is moderate.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The Orthents are used mainly for recreation and summer range. The main concerns in management on this soil are the steep slopes and the hazard of erosion. This soil is poorly suited to the production of timber because of its isolated location in or adjacent to wilderness areas.

192 - Pilliken coarse sandy loam, 5 to 30 percent slopes.

This deep and well drained soil is on mountainsides. It formed from material weathered from granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,200 to 5,500 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Included in this unit are small areas of Bighill, Chaix, Dome, Ledford, and Zeibright soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop and a soil similar to Pilliken that has a light colored surface horizon. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Pilliken soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. The main concern in producing and harvesting timber on this unit is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The production of forage is transitory and limited by the amount of competition from conifers.

193 - Pilliken coarse sandy loam, 30 to 50 percent slopes.

This deep and well drained soil is on mountainsides. It formed from material weathered from granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,000 to 6,000 feet. The average annual precipitation is 55 to 60 inches.

Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Included in this unit are small areas of Bighill, Chaix, Dome, Ledford, and Zeibright soils and Lithic Xerumbrepts. Also included are small areas of rock outcrop and a soil similar to Pilliken that has a light colored surface horizon. Included areas make up about 30 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is high.

This soil is used mainly for timber production. It is also used for summer range.

The Pilliken soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. This soil is suited to only limited use as summer range because of steep slopes.

194 - Pilliken-Rock outcrop complex, 5 to 30 percent slopes.

This map unit is on mountainsides and ridgetops. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,200 to 5,600 feet. The average annual precipitation is 55 to 60 inches.

This unit is 50 percent Pilliken coarse sandy loam and 25 percent Rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Chaix, Bighill, Dome, Ledford, and Zeibright soils and Lithic Xerumbrepts. Also included are small areas of a soil similar to Pilliken that has a light colored surface horizon and a soil similar to Pilliken that is loamy sand texture throughout. Included areas make up about 25 percent of the total acreage.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is moderate.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is not suited to the production of timber because of the areas of rock outcrop. The Pilliken soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the presence of Rock outcrop and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. Yarding paths, skid trails, and fire breaks are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Potential surface runoff from rock outcrop areas may require modification in skid trail layout, erosion control measures, and ground cover requirements to prevent erosion from concentrated flows. Rock outcrop on the surface hinders harvesting operations and can cause breakage of timber when felled. The production of forage is transitory and limited by the amount of competition from conifers.

195 - Pilliken-Rock outcrop complex, 30 to 50 percent slopes.

This map unit is on mountainsides and ridgetops. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,200 to 5,600 feet. The average annual precipitation is 55 to 60 inches.

This unit is 50 percent Pilliken coarse sandy loam and 25 percent Rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Chaix, Bighill, Dome, Ledford, and Zeibright soils and Lithic Xerumbrepts. Also included are small areas of a soil similar to Pilliken that has a light colored surface horizon and a soil similar to Pilliken that is loamy sand texture throughout. Included areas make up about 25 percent of the total acreage.

The Pilliken soil is deep and well drained. It formed in material weathered from granitic rock. Typically, the surface layer is dark grayish brown, brown, and pale brown coarse sandy loam about 25 inches thick. The substratum is very pale brown gravelly coarse sandy loam about 33 inches thick. Highly weathered granitic rock is at a depth of 58 inches. In some areas the surface layer is sandy loam or loam.

Permeability of the Pilliken soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is high.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

Much of this unit is not suited to production of timber because of the areas of rock outcrop. The Pilliken soil is suited to the production of timber. The culmination mean annual increment (CMAI) is estimated to be from 120 to 164 cubic feet per acre for ponderosa pine. Areas of rock outcrop in this unit can reduce yield by about 25 percent. The main concerns in producing and harvesting timber on this unit are the steep slopes, the presences of Rock outcrop, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. Rock outcrop on the surface hinders harvesting operations and can cause breakage of timber when felled. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Yarding paths, skid trails, and fire breaks, are subject to rill and gully erosion unless protected by adequate water bars or ground cover. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This unit is suited to only limited use as summer range because of steep slopes.

196 - Pits, borrow

Pits are sand and gravel pits and rock quarries. They are typically barren. All vary in natural drainage, permeability, erosion hazard, runoff, and available water capacity.

197 - Riverwash

Riverwash occurs in and along channels of creeks and rivers. The material is highly stratified stony and bouldery sand that is typically barren. It is inundated yearly by floodwater. Riverwash is subject to scouring or cutting as well as to deposition, depending on riverflow and bedload.

Permeability is very rapid. The available water capacity and drainage are variable. Surface runoff is rapid. The hazard of erosion is very high.

Riverwash is used for watershed. It also provides good habitat for wildlife.

198 - Rock outcrop

Rock outcrop is exposed metamorphic rock, andesitic lahar, serpentine rock, or granitic rock formations which are highly resistant to weathering. The rock outcrops are mainly on steep to very steep slopes in major drainages. The andesitic lahar rock outcrop is found on the tops and sides of volcanic tabular ridges. At the higher elevations, it is generally associated with glaciated topography. At the lower elevations, it is generally associated with the Maymen, and Ledmount soils and Lithic Xerumbrepts.

These areas are essentially barren. The only plant cover is sparse grasses and browse and stunted trees.

199 - Rock outcrop-Cryumbrepts association, 15 to 75 percent slopes.

This map unit is on glaciated mountainsides. The rock outcrop is

barren. The Lodgepole Pine series typically occurs on the

Cryumbrepts component of this unit. Elevation is 6,500 to 9,500 feet. The average annual precipitation is 50 to 70 inches.

This unit is 50 percent rock outcrop and 30 percent Cryumbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Lithic Xerumbrepts and Xerumbrepts soils. Also included are small areas of Cryumbrepts, wet soils found along tributary drainages. Included areas make up about 20 percent of the total acreage.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The Cryumbrepts soil is moderately deep, deep, or very deep and moderately well drained or well drained. It formed in glacially deposited material. The Cryumbrepts component is found on moraines, glacial till, and outwash terraces and alluvial plains. Typically, it has a dark surface and loamy sand, coarse sandy loam, or sandy loam textures throughout the profile with rock fragments ranging from 15 to 60 percent. In some areas the surface layer is stony or bouldery.

Permeability of the Cryumbrepts soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to over 60 inches thick to glacial till or outwash. The maximum erosion hazard is high.

The Cryumbrepts soil is used mainly for recreation and summer range. The main concerns in management on this soil are steep and very steep slopes and hazard of erosion. This soil is poorly suited to the production of timber because of its isolated location in or adjacent to wilderness areas.

200 - Rock outcrop-Tinker association, 15 to 75 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Huckleberry Oak series typically occurs on the Tinker component of this unit. Elevation is 6,000 to 7,200 feet. The average annual precipitation is 55 to 70 inches.

This unit is 65 percent rock outcrop and 20 percent Tinker very cobbly coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts, wet, and Tallac soils. Also included are small areas of a soil similar to Tinker that has bedrock at a depth of less than 40 inches; a soil similar to Tinker that has a thin, dark surface horizon and a soil similar to Tinker that has loamy sand or sandy textures throughout. Included areas make up about 15 percent of the total acreage.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

The Tinker soil is moderately deep and moderately well drained or well drained. It formed in material weathered from glacial till composed primarily of granitic rock. Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown ahd light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

This unit is used for limited timber production. It is also used for summer range.

Most of this unit is poorly suited to the production of timber because of the areas of rock outcrop. The Tinker soil is poorly suited to production of timber. The culumination mean annual increment (CMAI) is estimated to be from 50 to 85 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Cable yarding system are suited to this soil because they protect the surface soil from excessive disturbances. The use of ground base equipment for site prepartion is not practical because of the steepness of slope. Rock outcrop on the surface hinders harvesting operations and can cause breakage of timber when felled. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. This unit is suited to only limited use as summer range because of the steep and very steep slopes.

201 - Tallac very cobbly sandy loam, 2 to 30 percent slopes.

This deep or very deep, moderately well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial deposits composed primarily of granitic rock. The Mixed Conifer-Fir series typically occurs on this unit. Elevation is 5,800 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam, or gravelly sandy loam.

Included in this unit are small areas of Tinker soils, Lithic Xerumbrepts and rock outcrop. Also included are small areas of a soil similar to Tallac that is lacking a thick dark surface horizon. In a few areas slopes are greater than 30 percent. Included areas make up about 15 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Tallac soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for Red Fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragment in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

202 - Tallac very cobbly sandy loam, 15 to 30 percent slopes, stony.

This deep or very deep, moderately well drained soil is on lateral and terminal moraines. It formed in material weathered from glacial deposits composed primarily of granitic rock. The Huckleberry Oak series typically occurs on this unit. Elevation is 6,000 to 7,200 feet. The average annual precipitation is 55 to 70 inches.

Typically, stones cover 1 to 3 percent of the surface area. The surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Included in this unit are small areas of Notned and Tinker soils. Also included are small areas of rock outcrop. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Tallac soil is poorly suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 119 cubic feet per acre for Red Fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Stones on the surface hinder harvesting operations and can cause breakage of timber when felled. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capcity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

203 - Tallac-Cryumbrepts, wet association, 15 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Fir series with small areas of the Sedge-Rush and Lodgepole Pine series typically occurs on this unit. Elevation is 6,000 to 7,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 60 percent Tallac very cobbly sandy loam and 30 percent Cryumbrepts, wet. The percentage may vary from one area to another.

Included in this unit are small areas of Gerle, Tinker, and Waca soils. Also included are small areas of a soil similar to Tallac that has sandy textures. Included areas make up about 10 percent of the total acreage.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Cryumbrepts, wet is moderately deep, deep or very deep and somewhat poorly drained or poorly drained. It formed in mixed glacial alluvium. The Cryumbrepts, wet component is found in drainways and basins, and on flood plains. The surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 5 to 65 percent.

Permeability of the Cryumbrepts, wet is moderately rapid. Effective rooting depth is 20 to 40 inches thick, with a water table generally within 30 inches of the surface. The maximum erosion hazard is moderate.

This unit is used for timber production. It is also used for summer range.

Much of this unit is poorly sited to the production of timber because of the poorly drained Cryumbrepts, wet. The Tallac soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for Red Fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. Because the rooting depth is restricted by a seasonal water table in areas adjacent to Cryumbrept, wet areas, trees are occasionally subject to windthrow when the soil is wet and the winds are strong. The production of forage is transitory and limited by the amount of competition from conifers.

The Cryumbrepts, wet is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and the seasonal flooding. Because of the presence of a high water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations on this soil. This soil is not suited to production of timber. Grazing should be delayed until the soil has drained and is firm enough to withstand tramping by livestock.

204 - Tallac Variant-Lithic Xerumbrepts-Rock outcrop complex, 15 to 50 percent slopes

This map unit is on mountainsides. The Huckleberry Oak series typically occurs on this unit. Elevation is 5,800 to 7,800 feet. The average annual precipitation is 55 to 70.

This unit is 35 percent Tallac Variant gravelly fine sandy loam, 30 percent Lithic Xerumbrepts, and 20 percent Rock outcrop. The percentage may vary from one area to another.

Included in this map unit are small areas of Hangtown, Smokey, and Tinker soils. Also included are small areas of rubbleland. Included areas make up about 15 percent of the total acreage.

The Tallac Variant soil is moderately deep and well drained. It formed in material weathered from metasedimentary rocks. Typically, the upper 3 inches of the surface layer is dark brown gravelly fine sandy loam. The lower 20 inches is dark brown and brown very gravelly fine sandy loam. The upper 11 inches of the substratum is yellowish brown very cobbly fine sandy loam. The lower 4 inches is very stony sandy loam. Fractured metasedimentary rock is at a depth of 38 inches. In some areas the surface layer is very gravelly fine sandy loam or very gravelly loam.

Permeability of the Tallac Variant soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Lithic Xerumbrepts is shallow and excessively drained. They formed in material weathered from metamorphic rock. They have dark colors throughout the profile. Textures are sandy loam, fine sandy loam, or loam with 5 to 65 percent rock fragments.

Permeability of the Lithic Xerumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. The maximum erosion hazard is high.

Rock outcrop occurs as scattered areas of metasedimentary rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase the erosion hazard on downslope soils.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used for limited timber production. It is also used for summer range.

Most of this unit is poorly suited to the production of timber because of the shallow Lithic Xerumbrepts and areas of rock outcrop. The Tallac Variant soil is poorly suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 20 to 84 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth, the low available water capacity, the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require additional dust abatement during dry periods to reduce road surface degradation and to improve visibility. This unit is suited to only limited use as summer range because of steep slopes.

205 - Tinker very cobbly coarse sandy loam, 30 to 75 percent slopes.

This moderately deep, moderately well drained or well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial till composed primarily of granitic rock. The Huckleberry Oak series typically occurs on this unit. Elevation is 5,500 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown and light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Included in this unit are small areas of Tallac soils and rock outcrop. Also included are small areas of a soil similar to Tinker that has a light colored surface horizon or a thick dark surface horizon. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Tinker soil is poorly suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Cable yarding system are suited to this soil because they protect the surface soil from excessive disturbances. The use of ground base equipment for site preparation is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragment in the surface layer in some areas makes planting seedlings difficult. This soil is suited to only limited use as summer range because of the steep and very steep slopes.

206 - Tinker-Cryumbrepts, wet-Rock outcrop association, 2 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Lodgepole Pine series typically occurs on the Tinker component of this unit. The Willow series typically occurs on the Cryumbrepts, wet component. Elevation is 6,500 to 9,500 feet. The average annual precipitation is 55 to 65 inches.

This unit is 40 percent Tinker very cobbly coarse sandy loam, 25 percent Cryumbrepts, wet, and 20 percent rock outcrop. The percent may vary from one area to another.

Included in this unit are small areas of Tallac soils and Lithic Xerumbrepts. Also included are small areas of a soil similar to Tinker that has a light colored surface. Included areas make up about 15 percent of the total acreage.

The Tinker soil is moderately deep and moderately well drained or well drained. It formed in material weathered from glacial till composed primarily of granitic rock. Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown ahd light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is moderate.

The Cryumbrepts, wet soil is moderately deep, deep, or very deep and somewhat poorly drained or poorly drained. It formed in mixed glacial alluvium. The Cryumbrepts, wet component is found in drainways and basins, and on flood plains on slopes of 5 to 30 percent. The surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 0 to 65 percent.

Permeability of the Cryumbrepts, wet is moderately rapid. Effective rooting depth is 20 to 40 inches thick, with a water table generally within 30 inches of the surface. The maximum erosion hazard is high.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase the erosion hazard on downslope soils.

This unit is used for limited timber production. It is also used for summer range.

Most of this unit is poorly suited to the production of timber because of the Cryumbrepts, wet and areas of rock outcrop. The Tinker soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity, the seasonal water table, maintaining the soil depth, and the hazard of erosion. Because the rooting depth is restricted by a seasonally high water table, trees are occasionally subject to windthrow when the soil is wet and the winds are strong. When these soils are situated in a position where water runoff concentrates from rock outcrop or shallow soils, skid trail layout, erosion control measures, and ground cover requirements may need to be modified. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. This soil is suited to only limited use as summer range on the steeper slopes.

The Cryumbrepts, wet is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and seasonal flooding. This soil is not forested and is not suited to the production of timber. Because of its water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations on this soil. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock.

207 - Tinker-Tallac complex, 50 to 75 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Huckleberry Oak or Mountain Whitethorn series typically occurs on the Tinker component of this unit. The Mixed Conifer-Fir series typically occurs on the Tallac component of this unit. Elevation is 5,400 to 7,000 feet. The average annual precipitation is 55 to 70 inches.

This unit is 50 percent Tinker very cobbly coarse sandy loam and 30 percent Tallac very cobbly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Gerle and Notned soils and rock outcrop. Also included are small areas of soils similar to Tallac and Tinker that have sandy textures. Included areas make up about 20 percent of the total acreage.

The Tinker soil is moderately deep and moderately well drained or well drained. It formed in material weathered from glacial till composed primarily of granitic rock. Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown ahd light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. Cable yarding system are suited to this soil because they protect the surface soil from excessive disturbances. The use of ground based equipment for site prepartion is not practical because of the steepness of slope. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of the very steep slopes.

208 - Tinker-Tallac-Rock outcrop association, 5 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Huckleberry Oak or Mountain Whitethorn series typically occurs on the Tinker component of this unit. The Mixed Conifer-Fir series typically occurs on the Tallac component of this unit. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 35 percent Tinker very cobbly coarse sandy loam, 30 percent Tallac very cobbly sandy loam, and 20 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Gerle and Notned soils. Also included are small areas of a soil similar to Tinker that is shallow or moderately deep to rock and a soil similar to Tallac that has a sandy textures throughout. Included areas make up about 10 percent of the total acreage.

The Tinker soil is moderately deep and moderately well drained or well drained. It formed in material weathered from glacial till composed primarily of granitic rock. Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown ahd light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is moderate.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. The surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Tinker soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity, maintaining the soil depth, and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

The Tallac soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for Red Fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

Rock outcrop hinders harvesting operations and can cause breakage of timber when felled. When rock outcrop concentrates water runoff on adjacent soils, skid trail layout, erosion control measures, and ground cover requirements may need to be modified.

209 - Tinker-Tallac-Rock outcrop association, 30 to 75 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Huckleberry Oak or Mountain Whitethorn series typically occurs on the Tinker component of this unit. The Mixed Conifer-Fir series typically occurs on the Tallac component of this unit. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 40 percent Tinker very cobbly coarse sandy loam, 30 percent Tallac very cobbly sandy loam, and 20 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Gerle and Notned soils. Also included are small areas of a soil similar to Tinker that is shallow or moderately deep to rock and a soil similar to Tallac that has a sandy textures throughout. Included areas make up about 10 percent of the total acreage.

The Tinker soil is moderately deep and moderately well drained or well drained. It formed in material weathered from glacial till composed primarily of granitic rock. Typically, the surface layer is grayish brown and brown very cobbly coarse sandy loam about 18 inches thick. The subsoil is light yellowish brown very cobbly coarse sandy loam about 12 inches thick. The upper 6 inches of the substratum is pale brown very cobbly coarse sandy loam. The lower part to a depth of 41 inches is light yellowish brown ahd light gray very cobbly sandy loam and is weakly cemented or compacted. In some areas the surface layer is stony sandy loam or cobbly sandy loam.

Permeability of the Tinker soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 21 to 40 inches. The maximum erosion hazard is high.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. The surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

This unit is used for timber production. It is also used for summer range.

The Tinker soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 50 to 119 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, the low available water capacity, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suited in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that and adequate ground cover remains to protect the soil surface. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. This soil is suited to only limited use as summer range because of the steep and very steep slopes.

The Tallac soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of

wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. This soil is suited to only limited use as summer range because of the steep and very steep slopes.

Rock outcrop hinders harvesting operations and can cause breakage of timber when felled. When rock outcrop concentrates water runoff on adjacent soils, skid trail layout, erosion control measures, and ground cover requirements may need to be modified.

210 - Umbrepts-Tallac-Gerle association, 15 to 30 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Sedge-Rush series typically occurs on the Umbrepts component of this unit. The Mixed Conifer-Fir series typically occurs on the Tallac and Gerle components. Elevation is 5,800 to 7,000 feet. The average annual precipitation is 55 to 65 inches.

This unit is 30 percent Umbrepts, 30 percent Tallac very cobbly sandy loam, and 30 percent Gerle coarse sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas of Notned and Tinker soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

Umbrepts are somewhat poorly drained or moderately well drained soils that formed in alluvial material along drainages and on glacial outwash. Typically, they have dark surface horizons. The profile has stratified layers with textures ranging from clays to loams with 50 to 70 percent rock fragments.

Permeability of the Umbrepts is slow or moderately slow. The maximum erosion hazard is moderate.

The Tallac soil is deep or very deep and moderately well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is very dark grayish brown, dark brown, and brown very cobbly sandy loam about 29 inches thick. The substratum to a depth of 61 inches is yellowish brown and light yellowish brown very gravelly sandy loam. In some areas the surface layer is gravelly coarse sandy loam, cobbly sandy loam or gravelly sandy loam.

Permeability of the Tallac soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The Gerle soil is very deep and well drained. It formed in material weathered from glacial till, glacial outwash, and alluvium composed primarily of granitic rock. Typically, the surface layer is dark brown and dark yellowish brown coarse sandy loam about 12 inches thick. The subsoil is yellowish brown and light yellowish brown coarse sandy loam about 18 inches thick. The upper 11 inches of the substratum is yellowish brown coarse sandy loam. The lower part to a depth of 62 inches is yellowish brown cobbly coarse sandy loam. In some areas the surface is coarse sandy loam or gravelly sandy loam.

Permeability of the Gerle soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. The maximum erosion hazard is moderate.

This unit is used for limited timber production. It is also used for summer range.

The Umbrepts is well suited to use as summer range. The main concerns in range management on this unit are the hazard of seasonal flooding, the presence of a high seasonal water table, and the stability of stream bank. Because of the presence of a water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations on this soil. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock.

The Tallac soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for Red Fir. The main concerns in producing and harvesting timber on this soil are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited to the amount of competition from conifers.

The Gerle soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil

surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seeding survival on south and southwest facing slopes. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited to the amount of competition from conifers.

211 - Waca cobbly sandy loam, 5 to 30 percent slopes.

This moderately deep, well drained soil is on mountainsides. It formed in material weathered from andesitic lahar. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 9,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Included in this unit are small areas of Lithic Cryumbrepts and Windy soils. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. The effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifer.

212 - Waca cobbly sandy loam, 30 to 50 percent slopes.

This moderately deep, well drained soil is on mountainsides. It formed in material weathered from andesitic lahar. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 9,000 feet. The average annual precipitation is 55 to 70 inches.

Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Included in this unit are small areas of Lithic Cryumbrepts and Windy soils. Also included are small areas of rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. The effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This soil is suited to only limited use as summer range because of steep slopes.

213 - Waca-Lithic Cryumbrepts association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on the Waca component of this unit. The Mules Ears series typically occurs on the Lithic Cryumbrepts component. Elevation is 6,000 to 10,000 feet. The average annual precipitation is 60 to 80 inches.

This unit is 65 percent Waca cobbly sandy loam and 25 percent Lithic Cryumbrepts. The percentage may vary from one area to another.

Included in this unit are small areas of Windy soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Lithic Cryumbrepts is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, or loam with rock fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density, and has some amorphous clay.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ref fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When these soils are situated in a position where water runoff concentrates from shallow soil or rock outcrop areas, skid trail layout, erosion control mesures, and ground cover requirements may need to be modified. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

The Lithic Cryumbrepts soil is used mainly for recreation and summer range. The main concerns in management on this soil are steep slopes, high runoff potential, and potential erosion hazard. This soil is not forested and is not suited to the production of timber because of its shallow depth.

214 - Waca-Lithic Cryumbrepts-Cryumbrepts, wet association, 5 to 30 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on the Waca component of this unit, the Mules Ears series typically occurs on the Lithic Cryumbrepts component, and the Willow series typically occurs on the Cryumbrepts, wet component. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 45 to 65 inches.

This unit is 50 percent Waca cobbly sandy loam, 25 percent Lithic Cryumbrepts, and 15 percent Cryumbrepts, wet. The percentage may vary from one area to another.

Included in this unit are small areas of Windy soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Lithic Cryumbrept is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, or loam with rock fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density, and has some amorphous clay.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. The maximum erosion hazard is moderate.

The Cryumbrepts, wet is moderately deep or very deep and somewhat poorly drained or poorly drained. It formed in mixed glacial alluvium. The Cryumbrepts, wet component is found along drainages. Typically, the surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 5 to 65 percent.

Permeability of the Cryumbrepts, wet soil is moderately rapid. Effective rooting depth is 20 to 40 inches thick, with a water table generally within 30 inches of the surface. The maximum erosion hazard is moderate.

This unit is used for limited timber production. It is also used for summer range.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth and the hazard of erosion. When these soils are situated in a position where water runoff is concentrates from Lithic Cryumbrept soil areas, skid trail layout, erosin control measures and ground cover requirements may need to be modified. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

The Lithic Cryumbrepts soil is used mainly for recreation and summer range. The main concerns in management on this soil are steep slopes, high runoff potential, and potential erosion hazard. This soil is non-timbered and is not suited to the production of timber because of its shallow depth.

The Cryumbrepts, wet soil is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and seasonal flooding. This soil is non-timbered and is not suited to the production of timber. Because of its water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations on this soil. Seasonal grazing use must be based on proper soil moisture conditions.

215 - Waca-Lithic Cryumbrepts-Cryumbrepts, wet association, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on the Waca component of this unit, the Mules Ears series typically occurs on the Lithic Cryumbrepts component, and the Willow series typically occurs on the Cryumbrepts, wet component. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 45 to 65 inches.

This unit is 45 percent Waca cobbly sandy loam, 30 percent Lithic Cryumbrepts, and 15 percent Cryumbrepts, wet. The percentage may vary from one area to another.

Included in this unit are small areas of Windy soils. Also included are small areas of rock outcrop. Included areas make up about 10 percent of the total acreage.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is high.

The Lithic Cryumbrepts is shallow and excessively drained. It formed in material weathered from andesitic lahar. Typically, it is sandy loam, fine sandy loam, or loam with rock fragments ranging from 20 to 80 percent. The surface layer is dark, has low bulk density and has some amorphous clay.

Permeability of the Lithic Cryumbrepts is moderately rapid. Available water capacity is very low. Effective rooting depth is 4 to 20 inches. The maximum erosion hazard is high.

The Cryumbrepts, wet is moderately deep or very deep and somewhat poorly to poorly drained. It formed in mixed glacial alluvium. The Cryumbrepts, wet component is found along drainages. Typically, the surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 5 to 65 percent.

Permeability of the Cryumbrepts, wet is moderately rapid. Effective rooting depth is 20 to 40 inches thick, with a water table generally within 30 inches of the surface. The maximum erosion hazard is moderate.

This unit is used for limited timber production. It is also used for summer range.

The Waca soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When these soils are situated in a position where water runoff concentrates from shallow soils areas, skid trail layout, erosion control measures, and ground cover requirements may need to be modified. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this unit for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

The Lithic Cryumbrepts soil is used mainly for recreation and summer range. The main concerns in management on this soil are steep slopes, high runoff potential, and potential erosion hazard. This soil is non-timbered and is not suited to the production of timber because of its shallow depth.

The Cryumbrepts, wet soil is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and seasonal flooding. This soil is non-timbered and is not suited to the production of timber. Because

of its water table, harvest operations on adjacent areas must be carefully planned to avoid ground equipment operations in these areas. Seasonal grazing use must be based on proper soil moisture conditions.

216 - Waca-Windy complex, 5 to 30 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 50 percent Waca cobbly sandy loam and 40 percent Windy gravelly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas Cryumbrepts, wet, Lithic Cryumbrepts, and Tallac soils. Also included are small areas of soils similar to Waca and Windy that have less than 35 percent rock fragments in the subsoil. The included areas make up about 10 percent of the total acreage.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Windy soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 7 inches of the surface layer is yellowish brown gravelly sandy loam. The lower 9 inches is dark brown and brown very cobbly sandy loam. The subsoil is dark brown and light yellowish brown extremely cobbly sandy loam about 30 inches thick. The substratum to a depth of 62 inches is pale brown extremely cobbly sandy loam.

Permeability of the Windy soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this unit are maintaining the soil depth and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

217 - Waca-Windy complex, 30 to 50 percent slopes.

This map unit is on mountainsides. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

This unit is 55 percent Waca cobbly sandy loam and 35 percent Windy gravelly sandy loam. The percentage may vary from one area to another.

Included in this unit are small areas Cryumbrepts, wet, Lithic Cryumbrepts, and Tallac soils. Also included are small areas of soils similar to Waca and Windy that have less than 35 percent rock fragments in the subsoil. The included areas make up about 10 percent of the total acreage.

The Waca soil is moderately deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 8 inches of the surface layer is dark grayish brown and dark brown cobbly sandy loam. The lower 19 inches is brown very cobbly sandy loam. Weathered andesitic lahar is at a depth of 27 inches. In some areas the surface layer is gravelly sandy loam or cobbly coarse sandy loam.

Permeability of the Waca soil is moderately rapid. Available water capacity is low. Effective rooting depth is 20 to 40 inches. The maximum erosion hazard is moderate.

The Windy soil is deep or very deep and well drained. It formed in material weathered from andesitic lahar. Typically, the upper 7 inches of the surface layer is yellowish brown gravelly sandy loam. The lower 9 inches is dark brown and brown very cobbly sandy loam. The subsoil is dark brown and light yellowish brown extremely cobbly sandy loam about 30 inches thick. The substratum to a depth of 62 inches is pale brown extremely cobbly sandy loam.

Permeability of the Windy soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

The components of this unit are so intricately intermingled that it is not practical to manage them separately. This unit is used mainly for timber production. It is also used for summer range.

This unit is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep slopes, the hazard of erosion, and maintaining the soil depth. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that site preparation methods do not remove any of the surface layers. An adequate ground cover must be retained to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This unit is suited to only limited use as summer range because of steep slopes.

218 - Windy gravelly sandy loam, 5 to 30 percent slopes.

This deep or very deep, well drained soil is on mountainsides. It formed in material weathered from andesitic lahar.The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

Typically, the upper 7 inches of the surface layer is yellowish brown gravelly sandy loam. The lower 9 inches is dark brown and brown very cobbly sandy loam. The subsoil is dark brown and light yellowish brown extremely cobbly sandy loam about 30 inches thick. The substratum to a depth of 62 inches is pale brown extremely cobbly sandy loam.

Included in this unit are small areas of Lithic Cryumbrepts, Tallac, and Waca soils. Included areas make up about 15 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Windy soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Windy soil is well suited to intensive production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concern in producing and harvesting timber on this unit is the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Unsurfaced logging roads require more than normal treatment for dust abatement during dry periods to reduce road surface degradation and to improve visibility. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

219 - Windy gravelly sandy loam, 30 to 50 percent slopes.

This deep or very deep, well drained soil is on mountainsides. It formed in material weathered from andesitic lahar. The Red Fir series typically occurs on this unit. Elevation is 6,000 to 8,500 feet. The average annual precipitation is 55 to 70 inches.

Typically, the upper 7 inches of the surface layer is yellowish brown gravelly sandy loam. The lower 9 inches is dark brown and brown very cobbly sandy loam. The subsoil is dark brown and light yellowish brown extremely cobbly sandy loam about 30 inches thick. The substratum to a depth of 62 inches is pale brown extremely cobbly sandy loam.

Included in this unit are small areas of Lithic Cryumbrepts, Tallac, and Waca soils. Included areas make up about 20 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Windy soil is moderately rapid. Available water capacity is low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Windy soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for red fir. The main concerns in producing and harvesting timber on this soil are the steep slopes and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The high content of rock fragments in the surface layer in some areas ma

220 - Xerumbrepts-Cryumbrepts, wet association, 5 to 50 percent slopes.

This map unit is on moraines, outwash terraces, and alluvial plains. The Red Fir series typically occurs on the Xerumbrepts component of this unit. The Willow series typically occurs on the Cryumbrepts, wet component. Elevation is 6,000 to 9,000 feet. The average annual precipitation is 50 to 65 inches.

This unit is 55 percent Xerumbrepts and 15 percent Cryumbrepts, wet. The percentage may vary from one area to another.

Included in this unit are small areas of Cryumbrepts and Orthents soils. Also included are small areas of rock outcrop. Included areas make up about 30 percent of the total acreage.

The Xerumbrepts soil is moderately deep or deep and moderately well drained or well drained. It formed in glacially deposited material. The Xerumbrepts component is on moraines, glacial till and glacial out wash terraces. Typically, the surface is dark and 20 to 40 inches thick. Textures are loamy sand, coarse sandy loam, or sandy loam throughout the profile with 15 to 80 percent rock fragments.

Permeability of the Xerumbrepts is moderatedly rapid or rapid. Available water capacity is very low. Effective rooting depth is 20 to 60 inches. The maximum erosion hazard is high.

The Cryumbrepts, wet is moderately deep, deep, or very deep and somewhat poorly drained or poorly drained. It formed in glacial alluvium. The Cryumbrepts, wet component is on alluvial plans along drainages. Typically, the surface horizon is dark with high organic matter. It is a highly variable soil with textures including loamy sand, sandy loam, loam, or silt loam with rock fragments ranging from 5 to 65 percent.

Permeability of the Cryumbrepts, wet is moderately rapid. Effective rooting depth is 20 to 40 inches thick, with a water table generally within 30 inches of the surface. The maximum erosion hazard is high.

The Xerumbrepts soils are used mainly for recreation, summer range, and wildlife habitat. The main concerns in management on this soil are the steep slopes and the hazard of erosion. This soil is not available for the production of timber because of its isolated location in or adjacent to wilderness areas.

The Cryumbrepts, wet soil is used mainly for summer range and wildlife habitat. The main concerns in management on this soil are the presence of a water table and the hazard of seasonal flooding. This soil is not suited to the production of timber. Grazing should be delayed until the soil has drained and is firm enough to withstand trampling by livestock.

221 - Zeibright extremely gravelly coarse sandy loam, 2 to 30 percent slopes.

This deep or very deep, well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial deposits composed primarily of granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 40 to 65 inches.

Typically, the surface layer is dark grayish brown extremely gravelly coarse sandy loam about 10 inches thick. The upper 25 inches of the substratum is brown and light yellowish brown extremely cobbly coarse sandy loam. The lower part to a depth of 61 inches is brownish yellow and light yellowish brown very cobbly and extremely stony coarse sandy loam. In some areas the surface layer is gravelly sandy loam or cobbly sandy loam.

Included in this unit are small areas of Dome, Gerle, and Notned soils, Lithic Xerumbrepts, and rock outcrop. Also included are small area of a soil similar to Zeibright that has a thin, dark surface horizon. Included areas make up about 15 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Zeibright soil is moderately rapid. Available water capacity is very low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is moderate.

This unit is used mainly for timber production. It is also used for summer range.

The Zeibright soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this unit are the low available water capacity and the hazard of erosion. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. The production of forage is transitory and limited by the amount of competition from conifers.

222 - Zeibright extremely gravelly coarse sandy loam, 30 to 75 percent slopes.

This deep or very deep, well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial deposits composed primarily of granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800 to 6,000 feet. The average annual precipitation is 40 to 65 inches.

Typically, surface layer is dark grayish brown extremely gravelly coarse sandy loam about 10 inches thick. The upper 25 inches of the substratum is brown and light yellowish brown extremely cobbly coarse sandy loam. The lower part to a depth of 61 inches is brownish yellow and light yellowish brown very cobbly and extremely stony coarse sandy loam. In some areas the surface layer is gravelly sandy loam or cobbly sandy loam.

Included in this unit are small areas of Dome, Gerle, and Notned soils, Lithic Xerumbrepts, and rock outcrop. Also included are small area of a soil similar to Zeibright that has a thin, dark surface horizon. Included areas make up about 25 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Zeibright soil is moderately rapid. Available water capacity is very low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Zeibright soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. This soil is suited to only limited use as summer range because of steep and very steep slopes.

223 - Zeibright gravelly sandy loam, 15 to 50 percent slopes.

This deep or very deep, well drained soil is on lateral and terminal moraines and glacial outwash. It formed in material weathered from glacial deposits composed primarily of granitic rock. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 5,100 to 5,800 feet. The average annual precipitation is 55 to 70 inches.

Typically, the surface layer is very dark grayish brown and brown gravelly sandy loam about 23 inches thick. The underlying material to a depth of 61 inches is pale brown and light gray very gravelly coarse sandy loam.

Included in this unit are small areas of Dome, Gerle, Notned, and Tallac soils. Included areas make up about 15 percent of the total acreage. The percentage may vary from one area to another.

Permeability of the Zeibright soil is moderately rapid. Available water holding capacity is low to moderate. Effective rooting depth is 40 inches or more. The maximum erosion hazard is high.

This unit is used mainly for timber production. It is also used for summer range.

The Zeibright soil is suited to production of timber. The culmination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep slopes, and the hazard of erosion. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. This soil is suited to only limited use as summer range because of steep slopes.

224 - Zeibright-Rock outcrop association, 15-75 percent slopes.

This map unit is on lateral and terminal moraines and glacial outwash. The Mixed Conifer-Pine series typically occurs on this unit. Elevation is 4,800, to 6,200 feet. The average annual precipitation is 40 to 65 inches.

This unit is 60 percent Zeibright extremely gravelly coarse sandy loam and 30 percent rock outcrop. The percentage may vary from one area to another.

Included in this unit are small areas of Notned and Tallac soils. Also included are small areas of a soil similar to Zeibright that is moderately deep to rock or a cemented or compacted horizon. Included areas make up about 10 percent of the total acreage.

The Zeibright soil is deep or very deep and well drained. It formed in material weathered from glacial deposits composed primarily of granitic rock. Typically, the surface layer is dark grayish brown extremely gravelly coarse sandy loam about 10 inches thick. The upper 25 inches of the substratum is brown and light yellowish brown extremely cobbly coarse sandy loam. The lower part to a depth of 61 inches is brownish yellow and light yellowish brown very cobbly and extremely stony coarse sandy loam. In some areas the surface layer is gravelly sandy loam or cobbly sandy loam.

Permeability of the Zeibright soil is moderately rapid. Available water capacity is very low to moderate. Effective rooting depth is 40 to 60 inches or more. The maximum erosion hazard is high.

Rock outcrop is isolated and massive bodies of granitic rock. Runoff is rapid and large quanities of water can concentrate downslope and may increase erosion hazard on downslope soils.

This unit is used mainly for timber production. It is also used for summer range.

The Zeibright soil is suited to production of timber. The culumination mean annual increment (CMAI) is estimated to be from 85 to 164 cubic feet per acre for ponderosa pine. The main concerns in producing and harvesting timber on this soil are the steep and very steep slopes, the hazard of erosion, and the low available water capacity. Minimizing the risk of erosion is essential in harvesting timber and in reforestation efforts. When harvesting timber, the steepness of slope restricts the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally are more suitable in the steeper areas because they can prevent excessive disturbance of the surface soil. When preparing this soil for reforestation, the steepness of slope restricts the use of ground based equipment in piling operations. Reforestation efforts must be carefully planned and managed so that an adequate ground cover remains to protect the soil surface from erosion. The low available water capacity in the surface layer significantly reduces conifer seedling survival on south and southwest facing slopes. The high content of rock fragments in the surface layer in some areas makes planting seedlings difficult. Cut and fill slopes tend to ravel because of the high amounts of rounded pebbles, cobbles, and stones in the soil profile. This soil is suited to only limited use as summer range because of the steep and very steep slopes.

Rock outcrop hinders harvesting operations and can cause breakage of timber when felled. When rock outcrop concentrates water runoff on adjacent soils, skid trail layout, erosion control measures, and ground cover requirements may need to be modified.