SURVEY OF SOIL MAP UNIT SENSITIVITY TO ACID DEPOSITION IN THE SIERRA NEVADA, CALIFORNIA

APPENDIX A - SOIL SURVEYS OF PORTIONS OF YOSEMITE, KINGS CANYON, AND SEQUOIA NATIONAL PARKS

APPENDIX B - TAXONOMIC UNIT AND MAP UNIT ATTRIBUTE DATABASE

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APPENDIX A

SOIL SURVEYS
OF PORTIONS OF

YOSEMITE NATIONAL PARK
KINGS CANYON NATIONAL PARK
SEQUOIA NATIONAL PARK

Supplemental Text To

SURVEY OF SOIL MAP UNIT SENSITIVITY
TO ACID DEPOSITION
IN THE
SIERRA NEVADA, CALIFORNIA

APPENDIX A: SOIL SURVEYS
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SOIL SURVEYS CONDUCTED WITHIN YOSEMITE, KINGS CANYON, AND SEQUOIA NATIONAL PARKS

INTRODUCTION

Soil survey information is available for the majority of the cryic and frigid western slope of the Sierra Nevada, with the notable exception of the National Parks. Approximately 680,500 unsurveyed acres occur within Yosemite; approximately 223,000 acres occur within Sequoia; and approximately 454,700 acres occur within Kings Canyon.

An important element of this project was to complete as much soil survey in these areas as financially possible and to use these resulting baseline data to rank soil map units in terms of their sensitivity response to acid deposition.

Potential survey areas were selected based upon a review of unsurveyed high alpine areas within the Study Area, proximity to alpine lakes sampled by other researchers, and anticipated sensitivity. Two or three alternatives were selected within each National Park. The final determination was based on:

- Availability of aerial photographs
- Availability of physical access into each area
- Permission by the National Park Service
- Approval by the Air Resources Board

Approximately 106,000 acres were selected for Order 3 soil survey, distributed among the parks in the following manner:

- Tuolumne Meadows area, Yosemite National Park (43,000 acres)

- o Dougherty Peak area, Kings Canyon National Park (25,000 acres)
- o Kern Canyon area, Sequoia National Park (38,000 acres)

METHODS

The surveys were conducted by professional soil scientists who applied the standards of the National Cooperative Soil Survey. Soils were classified according to the USDA Soil Taxonomy.

Available information describing the physical and biological characteristics of each survey area was collected and reviewed in detail. Nearby soil surveys were also reviewed as available. Map unit legends for adjacent areas served as a guide for developing the preliminary map unit legend for each area. Soil families were used as the basic taxonomic component.

Topographic maps and aerial photography for the study area were obtained prior to field activities. Mapping photos for the Sequoia and Kings Canyon areas were 1:22,000 scale black-and-white photos obtained from the National Park Service National Cartographic Center. Mapping photos for the Yosemite area were 1:15,000 scale color infrared photos obtained from the Yosemite Park Naturalist. The survey area boundaries were transferred to frosted acetate photo overlays.

For the Order 3 surveys, the minimum size delineation was 50 acres.

Map units were identified by transecting representative land units. Soil scientists examined and identified the soil at selected intervals to record soil characteristics and document other field observations. The observations were recorded on a standard form to maintain consistency in the data collection.

The results of a number of transects were summarized to verify the relative proportions of dominant and included soils e.g., taxonomic units) occurring within each mapping unit. Mapping unit boundaries were then plotted by observation and interpretation of aerial photographs. Observations were field-verified whenever necessary to maintain accuracy.

The specific information collected during the field survey includes the following:

- Detailed descriptions of the dominant taxonomic units
- Results of field transects
- Descriptions of the environmental characteristics of both individual soil profiles and mapping units
- Frosted, acetate overlays of mapping photos with mapping unit boundaries plotted on the overlays
- Soil samples of typifying soil profiles for laboratory analysis
- Description of the occurrence and density of plant species

The mapping unit boundaries from the mapping photos were transferred to clear overlays of the photo mylar quadrangle maps. Because of photo distortion in mountainous terrain, the information was transferred by viewing stereo photo pairs and placing the boundaries on corresponding landscape features noted on the topographic base.

After mapping unit boundaries were transferred to the quadrangle base, a conversion legend was created which placed each mapping unit into a sensitivity class.

HOW TO USE THIS REPORT

First, the user refers to the Index to Map Sheets to identify the map sheet that provides coverage of the area of interest.
Utilizing the map sheets, the user identifies the map unit symbol

assigned to a specific location. Once the map unit symbol is identified, the user refers to the Map Unit Description section of the appropriate soil survey report to find a characterization of the soils and landscape characteristics of the map unit.

More specific information regarding the components can be found in the section entitled Taxonomic Unit Descriptions.

REPORT ORGANIZATION

The soil survey reports which follow contain information on the 106,000 acres mapped under this effort. The mapping performed is presented separately for each National Park. Each report contains the following elements:

- Description of the Area
- Alphabetical List of Soil Taxonomic Units
- Classification Table of Taxonomic Units
- Taxonomic Unit Descriptions
- Descriptions of Map Units

Additional data, including chemical and physical characterization which is a basis for the assignment of sensitivity rankings, are included in Appendix B, Data Tables.

SOIL SURVEY OF
TUOLUMNE MEADOWS STUDY AREA
YOSEMITE NATIONAL PARK

DESCRIPTION OF THE AREA

LOCATION

The study area consists of about 43,000 acres in the east-central part of Yosemite National Park in the Sierra Nevada of California (Tuolumne Meadows 15' quadrangle and Mono Craters 15' quadrangle). It lies between the coordinates of latitude 37^0 49' and 37^0 57' north, and longitudes 119^0 13' and 119^0 30' west.

The area is bounded on the northwest and east by the park boundary that lies along the Sierra Crest between Tuolumne and Mono Counties, from White Mountain south to Kuna Peak. From White Mountain, the study area boundary runs approximately west-southwest along the ridge lines connecting Ragged Peak, Tuolumne Peak and southwest to the intersection of the ridgeline with the Mariposa County Line. It follows this county line for a short distance and continues south along a ridgeline to the Tioga Road (Highway 120) immediately southwest of Tenaya Lake. The southern boundary continues along the ridgelines connecting Tressidor, Echo, and Cathedral Peaks. It continues north a short way to Fairview Dome and Tuolumne Meadows. It follows Lyell Fork Creek for a distance and then continues along the ridgeline to Mammoth Peak and along the Kuna Crest to Kuna Peak, where it intersects the park boundary.

TERRAIN

The study area is primarily gently sloping to very steep alpine country lying just west of the Sierra Nevada Crest. Elevations

range from about 7900 feet at a point just below Tuolomne Falls, to more than 13,050 feet at the summit of Mount Dana on the Sierra Crest. The topography is predominantly complex and very bouldery; a result of extensive glaciation of the area. This glaciation has also served to carve the many peaks, lake basins and meadows, and dome-like rock structures that are so notable in the Yosemite area of the High Sierra.

GENERAL GEOLOGY

A large portion of the survey area is comprised of the massive granitic Tuolomne intrusive suite, much of which is overlain by a relatively thin mantle of glacial fill from the last Pleistocene episode. This acid intrusive granitic rock is mostly granodiorite, often characterized by large phenocrysts. At one time glacial ice covered much of the area below the higher peaks that are at elevations greater than about 11,000 feet. On the eastern margin of the survey area are metamorphosed volcanic and sedimentary rocks that were disrupted by the intrusion of granitic rocks of the Tuolomne Suite. The metasedimentary and metavolcanic rocks are mostly hornfels, local graywackes, and volcanic tuffs and flows.

VEGETATION

The natural vegetation of the study area is an expression of the upper reaches of the west side of the Sierra Nevada Crest. Below timberline, the coniferous forest is dominated by lodgepole pine with some mountain hemlock. Red fir and western white pine is found on some northerly slopes below 10,000 feet, with whitebark pine gradually replacing the lodgepole at elevations above 10,000 feet. The understory consists mostly of regenerating conifers, grasses, sedges, and scattered shrubs, most notably current and red mountain heather. The meadows support a wide variety of grasses,

sedges, and wildflowers, with lodgepole pine often encroaching around the margins. Higher alpine areas support mostly grasses, willows, and scattered white bark pine.

TABLE 1-Y

SOIL TAXONOMIC UNITS
(Alphabetical Order)

Tuolumne Meadows Study Area

Yosemite National Park

Aeric Cryaquepts, fine-loamy, mixed

Dystric Cryochrepts, coarse-loamy, mixed

Dystric Cryochrepts, loamy-skeletal, mixed

Lithic Cryochrepts, loamy, mixed

Lithic Cryochrepts, loamy-skeletal, mixed

Lithic Cryumbrepts, loamy, mixed

Lithic Xerumbrepts, loamy, mixed, frigid

Pachic Cryoborolls, loamy-skeletal, mixed

Typic Cryofluvents, coarse-loamy, mixed

Typic Cryofluvents, sandy-skeletal, mixed

Typic Cryumbrepts, loamy-skeletal, mixed

Typic Xerumbrepts, loamy-skeletal, mixed, frigid

TABLE 2-Y

CLASSIFICATION TABLE OF TAXONOMIC UNITS

Tuolomne Meadows Study Area

Yosemite National Park

ENTISOLS

Cryofluvents

Typic Cryofluvents, coarse-loamy, mixed
Typic Cryofluvents, sandy-skeletal, mixed

INCEPTISOLS

Cryaquepts

Aeric Cryaquepts, fine-loamy, mixed

Cryochrepts

Dystric Cryochrepts, coarse-loamy, mixed
Dystric Cryochrepts, loamy-skeletal, mixed
Lithic Cryochrepts, loamy, mixed
Lithic Cryochrepts, loamy-skeletal, mixed

Cryumbrepts

Typic Cryumbrepts, loamy-skeletal, mixed
Lithic Cryumbrepts, loamy, mixed

Xerumbrepts

Typic Xerumbrepts, loamy-skeletal, mixed, frigid
Lithic Xerumbrepts, loamy, mixed, frigid

MOLLISOLS

Cryoborolls

Pachic Cryoborolls, loamy-skeletal, mixed

TAXONOMIC UNITS OF THE TUOLUMNE MEADOWS STUDY AREA

DESCRIPTION OF TAXONOMIC UNITS

Aeric Cryaquepts, fine-loamy, mixed

This soil family consists of moderately deep soils forming in mixed alluvium and underlain by glacial till, or deep soils in recent alluvium. These soils are poorly drained and occur in kettles, depressions, and adjacent to drainageways on subalpine wet meadow areas. Slopes are 0 to 10 percent.

Typically, these soils have a thin dark surface layer, a gravelly to very gravelly loamy subsoil, underlain by a dense brittle gravelly hardpan of glacial till.

Following is a profile description of a representative pedon (7039-11) found in map unit *102 Dystric Cryochrepts - Aeric Cryaquepts complex, 0 to 15 percent slopes*. It is located in upper Dana Meadows about 1 mile south-southeast of the Tioga Pass Entry Station of Yosemite National Park; slope is 5 percent north; elevation is 9850 ft.; vegetation is grasses and sedges (colors are for dry soil unless otherwise noted):

A1--0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, black (10YR 2/1) moist; massive; slightly hard, friable, slightly sticky and nonplastic; many very fine, fine, and few medium roots; clear smooth boundary.

A2--3 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; weak fine sub-angular blocky structure; slightly hard, friable,

slightly sticky and slightly plastic; many very fine, fine, and few medium roots; 5 percent pebbles; clear smooth boundary.

2Bw1--9 to 16 inches; yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 3/4) moist; few fine prominent mottles of dark yellowish brown (moist); weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; 35 percent pebbles and 5 percent cobbles; abrupt smooth boundary.

2Bw2--16 to 24 inches; light yellowish brown (2.5Y 6/4) gravelly loam, olive brown (2.5Y 4/4) moist; common medium prominent mottles of dark yellowish brown (moist); weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and few medium roots; 20 percent pebbles and 5 percent cobbles; abrupt smooth boundary.

2Bx1--24 to 30 inches; light yellowish brown (2.5Y 6/4) dense and brittle hardpan that parts to gravelly loam, light olive brown (2.5Y 5/4) moist; many medium prominent mottles of yellowish brown (moist); massive; hard, firm, slightly sticky and slightly plastic; few very fine roots; 15 percent pebbles and 5 percent cobbles; abrupt smooth boundary.

2Bx2--30 to 60 inches; pale yellow (2.5Y 7/4) dense hardpan parting to gravelly sandy loam, light olive brown (2.5Y 5/4) moist; common medium prominent

mottles of light yellowish brown (moist); massive; hard, very firm, nonsticky and nonplastic; 25 percent pebbles and 5 percent cobbles.

Remarks: The particle-size control section averages 18 to 27 percent clay and 15 to 35 percent rock fragments. Depth to hardpan is 20 to 40 inches

Dystric Cryochrepts, coarse-loamy, mixed

This soil family commonly consists of deep, moderately well to well drained soils that formed in granitic colluvium and glacial till, with an influential component of volcanic ash in the solum. This soil is most often found on concave mountain benches, footslopes, and between joints in association with granitic rock outcrop. Less commonly, this family consists of moderately deep soils on glacial moraines underlain by a dense glacial till hardpan or rhyolitic tuff. Slopes are complex and range from 5 to 25 percent.

Typically the soils have a thin dark surface over a moderately developed subsoil characterized by a light bulk density.

Following is a profile description of a representative pedon (7228-5) found in the map unit *11 Jointed granitic outcrop - Lithic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes.* It is located about 0.6 miles northwest of Tuolomne Falls; slope is 7 percent north; elevation is 8400 ft.; vegetation is mainly lodgepole pine with mountain hemlock, grass, sedge, ribes, and mountain heather (colors are for dry soil unless otherwise noted):

Oi--3 inches to 0; slightly decomposed needles, twigs, and bark.

A--0 to 5 inches; brown (10YR 5/3) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and few medium roots; clear wavy boundary.

Bw1--5 to 13 inches; brown (7.5YR 5/4) sandy loam, very dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and few medium roots; gradual wavy boundary.

Bw2--13 to 24 inches; brown (7.5YR 5/4) sandy loam, very dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; 5 percent pebbles; gradual wavy boundary.

Bw3--24 to 60 inches; reddish yellow (7.5YR 6/6) cobbly sandy loam, strong brown (7.5YR 4/6) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and medium roots; 10 percent pebbles and 20 percent cobbles.

Remarks: The particle-size control section averages 5 to 35 percent rock fragments. Textures are fine sandy loam and sandy loam.

Dystric Cryochrepts, loamy-skeletal, mixed

In general, this soil family occurs on more northerly aspects and at higher elevations in the survey area than Typic Cryumbrepts (loamy-skeletal), but they are often associated in complex mapping units. Loamy-skeletal Dystric Cryochrepts commonly are well drained, moderately deep soils. They formed primarily in colluvium and residuum from granitic rocks, granitic glacial till, and are influenced by volcanic ash in the solum. However, in the Parker Pass Creek area, both the till and the colluvium has a mixed source of granitic, metavolcanic, and metasedimentary rock. A dense brittle hardpan or granodiorite bedrock commonly occurs between 20 to 40 inches. Less commonly, the till is unconsolidated or bedrock is at a depth of 40 to greater than 60 inches, especially on steeper colluvial soils. The surface is almost always very stony to extremely bouldery. Slopes are complex and range from 5 to 75 percent.

Typically the soils have a thin, dark, fine sandy loam surface layer. A moderately developed very gravelly to very stony subsoil with brighter colors overlies a dense till hardpan, or in some cases, granodiorite.

Following is a profile description of a representative pedon (7038-1) found in the map unit *100 Dystric Cryochrepts, 15 to 45 percent slopes.* It is located approximately 1.5 miles northwest of Mammoth Peak; slope is 32 percent north; elevation is 9800 ft.; vegetation is lodgepole pine with mountain hemlock, grass, sedge, and ribes (colors are for dry soil unless otherwise noted):

Oi--1 in to 0; slightly decomposed needles, leaves, and twigs.

A--O to 6 inches; dark grayish brown (10YR 4/2) cobbly fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and common medium roots; 5 percent stones, 15 percent cobbles, and 10 percent pebbles; clear wavy boundary.

Bw1--6 to 11 inches; yellowish brown (10YR 5/4) very stony sandy loam, dark brown (7.5YR 3/4) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, common medium and coarse roots; 20 percent stones, 15 percent cobbles, and 15 percent pebbles; abrupt wavy boundary.

Bw2--11 to 25 inches; light brown (7.5YR 6/4) extremely stony sandy loam, reddish brown (5YR4/4) moist; weak and moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine and medium roots; 30 percent stones, 15 percent cobbles, and 15 percent pebbles; clear wavy boundary.

2BC--25 to 37 inches; light yellowish brown (2.5Y 6/4) and (10YR 6/4) very gravelly fine sandy loam, olive brown (2.5Y 4/4) and dark yellowish brown (10YR-4/4) moist; common black organic staining on peds; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; 10 percent cobbles and 30 percent pebbles; abrupt smooth boundary.

2Cr--37 to 60+ inches; light yellowish brown (2.5Y 6/4) dense hardpan parting to very gravelly sandy loam, olive brown (2.5Y 4/4) moist; common black organic staining on peds; massive; firm, friable, nonsticky and nonplastic; common very fine and fine roots matting on top of horizon; 5 percent cobbles and 35 percent pebbles.

Remarks: The particle-size control section averages 35 to 60 percent rock fragments. Textures are fine sandy loam or sandy loam throughout. A discontinuous alluvial surface horizon is present in some pedons.

Lithic Cryochrepts, loamy, mixed

This soil family is found throughout the survey area and always associated with rock outcrop. It consists of shallow and very shallow, well drained soils over mostly granodiorite. In the Parker Pass Creek area the bedrock may be metamorphic. These soils are formed in colluvium and residuum, with the addition of slope-wash material and volcanic ash. They occur on glacially scoured basins, cirques, mountain sideslopes, and around rock outcrops, primarily on benches, ledges, and rock joints and crevices. Slopes are complex and range from 5 to 75 percent.

Typically these soils have a thin dark surface with a slightly developed subsoil over land granodiorite.

Following is a profile description of a representative pedon (7121-1) found in map unit *80 Lithic Cryochrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 5 to 30 percent slopes.* It is located about 0.5 miles northwest of Soda Springs; slope is 8 percent northeast; elevation is 8700 feet; vegetation is sedge and

grass with a 5 percent canopy of lodgepole pine (colors are for dry soil unless otherwise noted):

A--0 to 4 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 5 percent cobbles and 20 percent pebbles; clear wavy boundary.

Bw--4 to 15 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 5 percent cobbles and 25 percent pebbles; abrupt smooth boundary.

R--15+ inches; hard granodiorite.

Remarks: The particle-size control section averages 0 to 35 percent rock fragments. Depth to bedrock ranges from 5 to 20 inches.

Lithic Cryochrepts, loamy-skeletal, mixed

This soil family consists of shallow and very shallow well to somewhat excessively drained soils forming in colluvium and residuum from metamorphic rocks. The soils occur on mountain ridges and sideslopes. Slopes are 45 to 75 percent.

Typically, these soils have a thin dark surface layer, a weakly developed subsoil of extremely flaggy and extremely channery coarse sandy loam, overlying metavolcanic bedrock.

Following is a profile description of a representative pedon (7041-4) found in map unit *70 Metamorphic talus - Lithic Cryochrepts - Jointed metamorphic outcrop complex, 45 to 75 percent slopes*. It is located on Gaylor Peak about 0.6 miles northwest of the Tioga Pass Entry Station of Yosemite National Park; slope is 55 percent; elevation is 10,800 feet; vegetation is widely scattered whitebark pine, mountain heather, and sedges (colors are for dry soil unless otherwise noted):

Oi--1/4 inch to 0; slightly decomposed needles.

A--0 to 4 inches; brown (10YR 5/3) extremely flaggy coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 25 percent flags, 20 percent channers, and 20 percent pebbles; abrupt wavy boundary.

Bw--4 to 15 inches; light yellowish brown (10YR 6/4) extremely channery coarse sandy loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; 10 percent flags, 30 percent channers, and 30 percent pebbles; abrupt irregular boundary.

R--15 to 17+ inches; fractured, hard metavolcanic rock.

Remarks: Particle-size control section commonly averages 60 to 75 percent rock fragments. Depth to bedrock is 7 to 20 inches.

Lithic Cryumbrepts, loamy, mixed

This soil family consists of well to somewhat excessively drained shallow and very shallow soils. They formed in slope wash and colluvium and residuum from granitic rocks, with an influence of volcanic ash. They occur on benches, ledges, rock fissures, and steep slopes in complex with jointed granitic rock outcrop. Slopes are 10 to 55 percent.

Typically the soils have a dark surface layer and a weakly developed subsoil over hard granodiorite.

Following is a profile description of a representative pedon (7297-1) found in the map unit *11 Jointed granitic outcrop - Lithic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes.* It is located about 1 mile northwest of Tenaya Lake, approximately 0.5 miles north on Murphy Creek trail and 0.5 miles west of the creek; slope is complex 10 percent north-northwest; elevation is 8400 feet; vegetation is sparse lodgepole pine and grass (colors are for dry soil unless otherwise noted):

Oi--1 inch to 0; slightly decomposed pine litter.

A1--0 to 2 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 5 percent pebbles; abrupt smooth boundary.

A2--2 to 9 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft,

very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; 5 percent pebbles; abrupt smooth boundary.

Bw--9 to 18 inches; yellowish brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine and medium subangular blocky structure; many very fine, fine, common medium, and few coarse roots; 20 percent pebbles; abrupt irregular boundary.

R--18+ inches; hard fractured granodiorite.

Remarks: The particle-size control section averages 15 to 35 percent rock fragments. It should be noted, however, that there are dissimilar shallow soils that average more than 35 percent rock fragments, but occur in a pattern too complex to map separately.

Lithic Xerumbrepts, loamy, mixed, frigid

This soil family consists of shallow, well drained soils forming in colluvium and residuum over granodiorite. They occur on southerly aspects on glacially quarried sideslopes of granitic mountains and are associated with rock outcrop. Slope ranges from 30 to 60 percent.

Typically, the soils have a dark surface layer and brighter colored subsoil over granodiorite.

Following is a profile description of a representative pedon (7228-8) found in the map unit *60 Typic Xerumbrepts - Lithic Xerumbrepts - Jointed granitic outcrop complex, 30 to 60 percent slopes.* Traveling approximately 1 mile west along Highway 120 from the

southwest corner of Tuolomne Meadows, it is located north an upslope about 0.25 miles from the road; slope is 30 percent southeast; elevation is 8700 feet; vegetation is manzanita with scattered western juniper and lodgepole pine (colors are for dry soil unless otherwise noted):

A1--0 to 3 inches; grayish brown (10YR 5/2) gravelly fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent pebbles; clear wavy boundary.

A2--3 to 9 inches; grayish brown (10YR 5/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; 5 percent cobbles and 15 percent pebbles; abrupt wavy boundary.

Bw--9 to 12 inches; yellowish brown (10YR 5/4) cobbly fine sandy loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; 15 percent cobbles and 15 percent pebbles; abrupt irregular boundary.

R--12+ inches; hard fractured granodiorite.

Remarks: The particle-size control section averages 15 to 35 percent rock fragments.

Miscellaneous land type

Pachic Cryoborolls, loamy-skeletal, mixed

This soil family consists of deep, moderately well to somewhat poorly drained soils forming in colluvium. They occur on steep mountain sideslopes near treeline. They are found in concave positions and are associated with drainages, springs, seeps, and late spring snow melt. Slope ranges from 30 to 70 percent.

Typically the soils have a deep dark surface layer and lighter subsoil.

Following is a profile description of a representative pedon (7038-2) found in the map unit *40 Pachic Cryoborolls - Dystric Cryochrepts - Rock outcrop complex, 30 to 70 percent slopes.* It is located on the north face approximately 1 mile northwest of Mammoth Peak; slope is 40 percent north; elevation is 10,300 feet; vegetation is grass, willow, ribes, with scattered mountain hemlock and whitebark pine (colors are for dry soil unless otherwise noted):

Oi--2 inches to 0; sod mat with leaves, dead grass.

A1--0 to 9 inches; dark gray (10YR 4/1) very stony fine sandy loam, black (10YR 2/1) and very dark brown

(10YR 2/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, common medium, and coarse roots; 15 percent stones, 15 percent cobbles, and 10 percent pebbles; clear smooth boundary.

A2--9 to 22 inches; dark grayish brown (10YR 4/2) extremely stony sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and common medium roots; 30 percent stones, 15 percent cobbles, 15 percent pebbles; clear wavy boundary.

Bw--22 to 60 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, dark yellowish brown (10YR 3/4) moist; weak to moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 5 percent stones, 10 percent cobbles, and 30 percent pebbles.

Remarks: The particle-size control section averages 35 to 60 percent rock fragments, and twelve to 25 percent clay. Textures are loam, fine sandy loam, and sandy loam, and may be very gravelly, very cobbly, very channery, very stony, or extremely stony. Mottles below 30 inches are common.

Typic Cryofluvents, coarse-loamy, mixed

This soil family consists of very deep, poorly to somewhat poorly drained soils forming in recent alluvial valley fill material. Commonly, these soils are underlain by sand and gravel derived from

glacial outwash deposits. It is found in the wet meadow areas (Tuolomne and Dana), and along streams and drainages. Slopes are 0 to 5 percent.

Typically, the soils have a dark surface layer moderately high in organic matter. Below the surface layer, layers are stratified with medium to coarse textures.

Following is a profile description of a representative pedon (7228-1) found in the map unit *110 Typic Cryofluvents, 0 to 5 percent slopes*. It is located in a meadow adjacent to the Tuolomne River about 1.25 miles upstream (southeast) from Tuolomne Falls; slope is 1 percent northwest; elevation is 8350 feet; vegetation is grass, sedge, forbs (colors are for dry soil unless otherwise noted):

Oi--1/4 to 0 inches; partially decomposed grass and leaves of forbs.

A--0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; clear smooth boundary.

AC--8 to 18 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 3/3) moist; few fine prominent mottles of strong brown (moist); weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; gradual smooth boundary.

C1--18 to 35 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; common fine prominent mottles of strong brown (moist); weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; abrupt wavy boundary.

C2--35 to 60 inches; multicolored gravelly coarse sand; brown iron stains on pebbles; single grained; loose, nonsticky and nonplastic; few very fine and fine roots; 25 percent pebbles.

Remarks: Depth to sand and gravel ranges from 32 to greater than 60 inches. Buried surface horizons and thin layers of volcanic ash are common.

Typic Cryofluvents, sandy-skeletal, mixed

This soil family consists of very deep, somewhat poorly to poorly drained soils forming in recent alluvial material overlying sand and gravel. It is found in wet meadow areas, along streams and drainages, and in low depressions between ridges of glacial moraines. Slopes are 0 to 3 percent.

Typically, the surface and subsurface layers are dark with medium to moderately coarse textures. The substratum is stratified very gravelly or very cobbly loamy sand to extremely gravelly coarse sand.

Following is a profile description of a representative pedon (7039-4) found in the map unit *51 Typic Cryumbrepts - Typic Cryofluvents complex, 0 to 20 percent slopes*. It is located in

Dana Meadows about 2 miles south of the Tioga Pass entry station of Yosemite National Park; slope is 1 percent west; elevation is 9350 ft.; vegetation is sedge and grass (colors are for dry soil unless otherwise noted):

Oi--4 to 3 inches; sod root mat of grass and sedge.

Oa--3 inches to 0; very decomposed sapric material.

A1--0 to 2 inches; grayish brown (10YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; abrupt smooth boundary.

A2--2 to 6 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; abrupt smooth boundary.

C1--6 to 11 inches; yellowish brown (10YR 5/4) and light gray (10YR 7/2) loam, dark yellowish brown (10YR 3/4) and grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; 10 percent pebbles; clear smooth boundary.

C2--11 to 17 inches; yellowish brown (10YR 5/4) very cobbly sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very

fine and fine roots; 25 percent cobbles and 25 percent pebbles; clear wavy boundary.

C3--17 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; 25 percent cobbles and 60 percent pebbles.

Remarks: Depth to sand and gravel is 15 to 25 inches. Many pedons have a buried surface horizon. Water table at 17 inches.

Typic Cryumbrepts, loamy-skeletal, mixed

This soil family is the most well represented family in the survey area, and is a component of several map units. Commonly, these are moderately deep, moderately well drained soils forming in granitic colluvium and glacial till, with a component of volcanic ash, overlying a dense, compact till hardpan. They are on ridges and sideslopes of lateral and ground moraines. In some cases, similar soils are underlain by granodiorite or localized rhyolitic tuff where glacial deposition is thin or has been eroded away. Less commonly, these soils are deep and well drained, forming in similar materials, but often characterized by a greater component of volcanic ash. They occur on steep colluvial mountain sideslopes and somewhat concave areas of moraines on benches, toeslopes, and along drainages. In the Parker Pass Creek area, similar deep soils are forming in colluvium and till of mixed granitic and metamorphic origin. slope ranges from 5 to 65 percent.

Typically the soils have a dark surface layer. The subsoil is weakly to moderately well developed with brighter colors, overlying a dense till hardpan.

Following is a profile description of a representative pedon (7062-3) found in the map unit *52 Typic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes.* It is located on Moraine Flat, approximately 1.2 miles north of Highway 120, and just west of the Gaylor Lakes Trail; slope is 16 percent south-southeast; elevation is 9800 feet; vegetation is lodgepole pine, grass, and sedge (colors are for dry soil unless otherwise noted):

Oi--1 inch to 0; slightly decomposed grass, needles, and twigs.

A1--0 to 4 inches; grayish brown (10YR 5/2) very stony sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 15 percent stones, 10 percent cobbles, and 10 percent pebbles; clear wavy boundary.

A2--4 to 13 inches; brown (10YR 5/3) very stony fine sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and common medium roots; 20 percent stones, 20 percent cobbles, and 15 percent pebbles; clear wavy boundary.

2Bw--13 to 29 inches; yellowish brown (10YR 5/4) extremely stony sandy loam, dark yellowish brown (10YR 3/6) moist; moderate medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine and medium roots; 25 percent stones, 20 percent cobbles, 15 percent pebbles; abrupt wavy boundary.

2Bx--29 to 41+ inches; brownish yellow (10YR 6/6) dense, brittle till parting to gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; common medium prominent mottles of strong brown and light olive brown; massive; hard, firm, nonsticky and nonplastic; few very fine roots; 5 percent cobbles and 20 percent pebbles.

Remarks: The particle-size control section averages 35 to 65 percent rock fragments. Surface and subsurface textures range from loam to sandy loam and may be gravelly to extremely stony sandy loams or coarse sandy loams.

Typic Xerumbrepts, loamy-skeletal, mixed, frigid

This soil family consists of moderately deep, well drained soils formed in colluvium, till, and rhyolitic tuff over granodiorite. They occur on southerly aspects on slightly concave, mid and lower sideslopes of glacially quarried granitic mountains. Slopes range from 30 to 60 percent.

Typically, the soils have a dark surface and a somewhat developed lighter subsoil over a paralithic contact of hard rhyolitic tuff.

Following is a profile description of a representative pedon (7263-2) found in map unit *60 Typic Xerumbrepts - Lithic Xerumbrepts - Jointed Granitic Outcrop Complex, 30 to 60 percent slopes.* It is located upslope from Highway 120 approximately 1 mile northeast of the north end of Tenaya Lake; slope is 50 percent southeast; elevation is 8500 feet; vegetation is mainly chinquapin with western juniper, Jeffrey pine, lodgepole pine, ribes, sagebrush, manzanita, and fescue (colors are for dry soil unless otherwise noted):

Oi--2 inches to 0; slightly and moderately decomposed leaves, twigs, and needles.

A1--0 to 7 inches; dark gray (10YR 4/1) cobbly sandy loam, very dark brown (10YR 2/2) moist; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; 15 percent cobbles; clear wavy boundary.

A2--7 to 10 inches; dark grayish brown (10YR 4/2) cobbly sandy loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; 10 percent cobbles and 10 percent pebbles; abrupt wavy boundary.

Bw1--10 to 17 inches; yellowish brown (10YR 5/6) very cobbly sandy loam, dark brown (7.5YR 3/4), moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; 20 percent cobbles and 20 percent pebbles; abrupt wavy boundary.

Bw2--17 to 24 inches; yellowish brown (10YR 5/4) very cobbly fine sandy loam, dark yellowish brown (10YR-3/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common medium, coarse, few fine, and very fine roots; 15 percent cobbles and 25 percent pebbles; abrupt irregular boundary.

2Cr--24 to 32+ inches; hard, ashy tuff.

Remarks: The particle-size control section averages 35 to 60 percent rock fragments. Textures are fine sandy loam and sandy loam.

TABLE 3-Y

MAP UNIT LEGEND
TUOLUMNE MEADOWS STUDY AREA
Yosemite National Park

SYMBOL	MAP UNIT NAME
10	Jointed granitic outcrop - Lithic Cryochrepts complex, 15 to 45 percent slopes.
11	Jointed granitic outcrop - Lithic Cryumbrepts -Dystric Cryochrepts complex, 5 to 30 percent slopes.
12	Jointed granitic outcrop - granitic talus - Lithic Cryochrepts complex, 45 to 130 percent slopes.
20	Unjointed granitic outcrop.
30	Lake.
40	Pachic Cryoborolls - Dystric Cryochrepts - Rock outcrop complex, 30 to 70 percent slopes.
50	Typic Cryumbrepts - Dystric Cryochrepts - Typic Cryofluvents complex, 0 to 35 percent slopes.
51	Typic Cryumbrepts - Typic Cryofluvents complex, 0 to 20 percent slopes.
52	Typic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes.
53	Typic Cryumbrepts, 25 to 55 percent south slopes.
54	Typic Cryumbrepts, 15 to 45 percent north slopes.
55	Typic Cryumbrepts - Lithic Cryochrepts - Jointed granitic outcrop complex, 5 to 30 percent slopes.
60	Typic Xerumbrepts - Lithic Xerumbrepts - Jointed granitic outcrop complex, 30 to 60 percent slopes.
70	Metamorphic talus - Lithic Cryochrepts - Jointed metamorphic outcrop complex, 45 to 75 percent slopes.

MAP UNIT LEGEND, Continued

SYMBOL	MAP UNIT NAME
71	Metamorphic outcrop - Lithic Cryochrepts - Typic Cryumbrepts complex, 15 to 75 percent slopes.
72	Metamorphic outcrop - metamorphic talus - Typic Cryumbrepts complex, 35 to 130 percent slopes.
80	Lithic Cryochrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 5 to 30 percent slopes.
81	Lithic Cryumbrepts - Dystric Cryochrepts - Jointed granitic outcrop complex, 30 to 55 percent slopes.
82	Lithic Cryochrepts - Jointed granitic outcrop complex, 5 to 30 percent slopes.
90	Dystric Cryochrepts - Typic Cryumbrepts - metamorphic talus complex, 45 to 75 percent slopes.
91	Dystric Cryochrepts, 15 to 60 percent slopes.
100	Dystric Cryochrepts, 15 to 45 percent slopes.
101	Dystric Cryochrepts - Jointed granitic outcrop -Lithic Cryochrepts complex, 40 to 75 percent slopes.
102	Dystric Cryochrepts - Aeric Cryaquepts complex, 0 to 15 percent slopes.
110	Typic Cryofluvents, 0 to 5 percent slopes.
W	Lakes and Other Water Bodies

MAP UNITS OF THE TUOLOMNE MEADOW STUDY AREA

DESCRIPTIONS OF MAP UNITS

10 Jointed granitic outcrop - Lithic Cryochrepts complex, 15 to 45 percent slopes

The mapping unit is found on glacially quarried cirque basins and valley floors, and footslopes and toeslopes of mountains. The rock is predominantly granodiorite of Cathedral Peak.

This map unit is on sideslopes of Kuna Crest, Ragged Peak, and the vicinity of Cathedral Peak and Medicott Dome. It is composed of 9 delineations.

- 80% Jointed granitic outcrop
- 15% Lithic Cryochrepts, loamy, mixed; 20 to 45 percent slopes.

The Lithic Cryochrepts are shallow, well drained soils that occur in joints, crevices, and on ledges associated with the rock outcrop. It formed in colluvium and residuum from granodiorite with an influence of volcanic ash. Vegetative cover is sparse, consisting of clumps and individual trees of whitebark pine with some lodgepole pine and mountain hemlock. Canopy cover is 10 percent or less.

Included in this unit are:

- 4% Lithic Cryorthents, loamy-skeletal, mixed; 20 to 45 percent slopes
- 1% Cryofluvents, 5 to 15 percent slopes

11 Jointed granitic outcrop - Lithic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes

The map unit occurs on topographically complex glacially scoured mountain footslopes and valley floors. The parent rock is predominantly Half-Dome and Cathedral Peak granodiorite. The rock outcrop is prominent and steep.

This map unit has 4 delineations near Murphy Creek, Tuolomne Falls, and Medicott Dome.

45% Jointed granitic outcrop
25% Lithic Cryumbrepts, loamy, mixed; 10 to 30 percent slopes
20% Dystric Cryochrepts, coarse-loamy, mixed; 5 to 15 percent slopes

The Lithic Cryumbrepts are shallow, well-drained soils occupying benches, ledges and crevices between rock joints. The Dystric Cryochrepts typically are deep moderately well drained soils found in concave sideslopes between widely spaced joints. In addition, there are moderately deep well drained soils in slightly higher, more convex positions. These soils formed in volcanic ash and granitic colluvium and residuum.

Vegetation is predominantly lodgepole pine with some mountain hemlock and an occasional whitebark pine. The canopy cover varies from 5 to 10 percent on Lithic Cryumbrepts to 15 to 25 percent on Dystric Cryochrepts. The understory contains grasses, sedges, ribes, phlox, and red mountain heather.

Included in this unit are:

8% Skeletal soils-Lithic Cryumbrepts and Dystric Cryochrepts that contain more than 35 percent rock fragments and are loamy-skeletal
2% Cryofluvents, 0 to 10 percent slopes

12 Jointed granitic outcrop - granitic talus - Lithic Cryochrepts complex, 45 to 130 percent slopes

The map unit is found on crests and ridges of mountains and headwalls of cirque basins. It is near or above treeline. The rock is granodiorite of the Cathedral Peak, Half Dome, and Kuna Crest formations.

This map unit has 4 delineations that occur on higher elevations near Ragged Peak, White Mountain, Mammoth Peak, and Kuna Crest.

50% Jointed granitic outcrop
20% Granitic talus
15% Lithic Cryochrepts, loamy, mixed, 45 to 75 percent slopes

The Lithic Cryochrepts are shallow, well-drained soils in joints, crevices, and on ledges.

Vegetation cover is sparse or non-existent. Stunted whitebark pine and heather occupy soil portions of this unit.

Included in this unit are:

5% Typic Cryorthents, sandy-skeletal, mixed, 30 to 50 percent slopes.

5% Cryaquepts
5% Felsenmeer

20 Unjointed granitic outcrop

This miscellaneous map unit consists of at least 80 percent exposed outcrops of granite or granodiorite with a spacing of 100 meters or more between vertical joints that are 2 meters or greater in depth. Sheet jointing parallel to the surface is common, as is evidence of glacial polish.

Included in this unit are:

10% Jointed granitic outcrop
5% Lithic Cryochrepts, loamy, mixed
5% Dystric Cryochrepts, loamy, mixed

The latter two inclusions support sparse clumps and stands of lodgepole and whitebark pine.

Examples of this unit are Pywiak, Polly, and Medicott Domes.

40 Pachic Cryoborolls - Dystric Cryochrepts - Jointed rock outcrop complex, 30 to 70 percent slopes

This map unit occurs on steep glaciated shoulders and backslopes of mountains near treeline. The unit is often characterized by avalanche chutes, debris flows, rock slides, seeps, and large boulders. There are 7 delineations near Mammoth Peak, Gaylor Lakes, and northeast of the Kuna Crest. The first two areas have soils dominated by granitic rocks. The latter area has soils influenced by granitic and metamorphic rocks.

45% Pachic Cryoborolls, loamy-skeletal, mixed, 30 to 60 percent slopes

20% Dystric Cryochrepts, loamy-skeletal, mixed, 35 to 70 percent slopes

15% Jointed rock outcrop

The Pachic Cryoborolls are deep, moderately well to somewhat poorly drained soils forming in colluvium. Slopes on the unit are complex and these soils tend to occupy concave positions that are both parallel and perpendicular to slope contour. The Dystric Cryochrepts are deep and moderately deep, well drained soils formed in colluvium and residuum on mostly convex slopes.

Included in this unit are:

13% Miscellaneous areas of talus, avalanche and landslide debris, rubbleland, and felsenmeer

5% Lithic Cryochrepts, loamy-skeletal, mixed

2% Poorly drained Cryofluvents and seeps

50 Typic Cryumbrepts - Dystric Cryochrepts - Typic Cryofluvents complex, 0 to 35 percent slopes

The map unit occurs on benched, bouldery sideslopes of moraines and valley floors. There are 4 delineations in the western part of the survey area.

50% Typic Cryumbrepts, loamy-skeletal, mixed, 10 to 35 percent slopes

20% Dystric Cryochrepts, coarse-loamy, mixed, 5 to 25 percent slopes

15% Typic Cryofluvents, coarse-loamy, mixed, 0 to 10 percent slopes.

The Typic Cryumbrepts are commonly deep, well and moderately well drained soils forming in granitic colluvium and glacial till. They are found on mainly north to east facing sideslopes of moraines on slightly concave to smooth slopes. Less commonly, they are moderately deep to granodiorite around rock outcrops. The Dystric Cryochrepts have a notable volcanic ash influence mixed with granitic colluvium. These soils are well to moderately well drained, deep or moderately deep, often overlying a dense till or rhyolitic tuff. They are found on benches and lower sideslopes of moraines adjacent to the valley floor. The Typic Cryofluvents are commonly somewhat poorly drained, deep soils forming in finer
recent alluvium over older, coarse glacial outwash. These soils are found on valley floors and drainageways.

Overstory vegetation is predominantly lodgepole pine throughout the map unit, especially on the Typic Cryofluvents. However, western white pine, red fir, and mountain hemlock are often well represented on the Typic Cryumbrepts and Dystric Cryochrepts. Below a good canopy cover of the latter two soils, the understory is often sparse grass, sedge, and ribes. Typic Cryofluvents have an understory of sedges, grass, ribes, geraniums, and azaleas.

Included in this unit are:

- 5% Jointed granitic outcrop
- 3% Granitic talus (especially below Tenaya Peak)
- 2% Wet meadow areas
- 5% Typic Cryofluvents, sandy-skeletal, mixed, 0 to 3 percent slopes

51 Typic Cryumbrepts - Typic Cryofluvents complex, 0 to 20 percent slopes

The map unit is found on very stony to extremely bouldery ground moraines of glacially scoured valleys and footslopes of granitic mountains. The morainal deposits have complex, hilly topography commonly with an east-west orientation of ridges. In between morainal ridges are concave areas, mostly trending the same direction, that contain kettles, small wet meadows, drainageways, and old outwash terraces that contain a variety of soils. Small lakes, ponds, and scoured granitic outcrops are also representative. There are 12 delineations of this unit, many of which are found on Moraine Flat and the lower end of Dana Meadows.

Included in this unit are:

65% Typic Cryumbrepts, loamy-skeletal, mixed, 5 to 20 percent slopes

15% Typic Cryofluvents, coarse-loamy and sandy-skeletal, mixed, 0 to 8 percent slopes

The Typic Cryumbrepts are moderately deep, moderately well and well drained soils forming in bouldery glacial till with an influence of volcanic ash in the upper solum. These soils are commonly underlain by a dense, weakly brittle hardpan or localized material from rhyolitic tuff. Less commonly, they are underlain by granodiorite. This occurs on ridges and shoulders where morainal deposits are thin, and in areas where morainal material has been eroded away, such as along streams and channels. The Typic Cryofluvents are very deep, somewhat poorly and poorly drained soils forming in Holocene alluvium, sometimes underlain by glacial outwash.

Vegetation is predominantly uneven-aged lodgepole pine with occasional mountain hemlock on the morainal Typic Cryumbrepts. The understory is grass, sedges, and ribes. Occupying the wet meadows of the Typic Cryofluvents are a variety of grasses, sedges, and hydrophilic plants with marginal encroachments of lodgepole pine.

Included in this unit are:

- 5% Dystric Cryochrepts, loamy-skeletal, mixed, 10 to 25 percent slopes
- 5% Granitic outcrop and associated shallow soils
- 5% Humic and Aeric Cryaquepts, fine-loamy, mixed, 0 to 3 percent slopes
- 3% Aquic Cryumbrepts, loamy-skeletal, mixed, 2 to 8 percent slopes
- 2% Ephemeral ponds and intermittent streams

Dystric Cryochrepts are found primarily on north slopes of moraines and on concave benches with a significant volcanic ash deposit. Humic and Aeric Cryochrepts occupy depressions (kettles that are often ponded in spring) and areas adjacent to ponds. Humic Cryaquepts are like Aeric Cryaquepts except they have grayer colors throughout the profiles. Aquic Cryumbrepts are found in small grassy areas between morainal ridges, and along toeslopes between moraines and larger wet meadows. Aquic Cryumbrepts are wetter than Typic Cryumbrepts.

52 Typic Cryumbrepts - Dystric Cryochrepts complex, 5 to 30 percent slopes

This map unit is on very stony to extremely bouldery moraines with complex benched, dissected, hilly topography. There are 4 delineations found on Moraine Flat and west of Cathedral Peak.

65% Typic Cryumbrepts, loamy-skeletal, mixed, 5 to 30 percent slopes

15% Dystric Cryochrepts, loamy-skeletal, mixed, 5 to 30 percent slopes

The Typic Cryumbrepts are moderately deep, moderately well and well drained soils. Typically, they formed in granitic glacial till with an influence of volcanic ash, over a dense, compact hardpan and localized material from rhyolitic tuff. Less commonly, these soils formed in colluvium and residuum with an influence of till and ash, and are underlain by granodiorite. Soils underlain by bedrock are usually found on shoulders and scoured ridgetops with thin morainal deposits, or on footslopes and adjacent to drainages where erosion has removed these deposits. The formation and parent material of the Dystric Cryochrepts do not differ significantly from the Typic Cryumbrepts other than the former have a greater influence of volcanic ash in the solum. Dystric Cryochrepts are found on ridges, concave areas, and more northerly slopes of moraines where accumulation of ash has been favored by position, and erosion off of rock outcrops and boulders.

Vegetation is predominantly uneven-aged lodgepole pine, occasionally with mountain hemlock and western white pine on more northerly aspects and near drainages and wet areas. Canopy cover varies

from about 35 to 60 percent. The understory is mostly grasses, sedges, and ribes.

Included in this unit are:

- 10% Sandy-skeletal, mixed, Dystric Cryochrepts and Typic Cryorthents, 5 to 30 percent slopes
- 5% Granitic rock outcrop
- 5% Typic Cryofluvents

53 Typic Cryumbrepts, 25 to 55 percent south slopes

This map unit has 4 delineations on steep, bouldery, south-facing slopes of lateral moraines. They are in the Moraine Flat area and east of Lembert Dome.

- 85% Typic Cryumbrepts, loamy-skeletal, mixed, 25 to 55 percent slopes.

The Typic Cryumbrepts are well drained soils forming in granitic glacial till with an admixture of volcanic ash. These soils are commonly moderately deep to hardpan till, rhyolitic tuff, or granodiorite bedrock. Less commonly, they are deep in unconsolidated morainal till.

Vegetation is lodgepole pine, grass, sedge, and ribes.

Included in this unit are:

- 5% Granitic outcrop
- 5% Lithic Cryumbrepts, loamy-skeletal, mixed, 25 to 45 percent slopes

5% Typic Cryorthents, sandy-skeletal, mixed, 25 to 55 percent slopes

54 Typic Cryumbrepts, 15 to 45 percent north slopes

The map unit is found on complex, benched, north-facing backslopes and often slightly concave footslopes of bouldery moraines on glacially eroded granitic mountainsides. There are 7 delineations, all in the southwestern portion of the survey area near Tenaya Peak, and Medicott, Polly, and Fairview Domes.

85% Typic Cryumbrepts, loamy-skeletal, mixed, 15 to 45 percent slopes

The Typic Cryumbrepts are well drained, deep soils forming in granitic colluvium over glacial till with an influence of volcanic ash in the upper solum.

Vegetation is a mixed coniferous forest of red fir, lodgepole pine, mountain hemlock, and western white pine. The understory contains sparse grass and sedges but good regeneration of coniferous species.

Included in this unit are:

5% Granitic outcrop
5% Talus, rubbleland, and Cryorthents resulting from landslides
5% Dystric Cryochrepts, loamy-skeletal, mixed, 15 to 45 percent slopes

55 Typic Cryumbrepts - Lithic Cryochrepts - Jointed granitic outcrop complex, 5 to 30 percent slopes

The mapping unit is on extremely bouldery shoulders, footslopes, and valleys of glacially scoured granitic mountains. There are 13 delineations of this map unit.

- 40% Typic Cryumbrepts, loamy-skeletal, mixed, 5 to 30 percent slopes
- 25% Lithic Cryochrepts, loamy, mixed, 5 to 30 percent slopes
- 20% Jointed granitic outcrop

The Typic Cryumbrepts are moderately well and well drained soils that occupy mostly concave depositional areas along drainageways, and on benches and footslopes between glacially scoured outcrops of granitic rocks. They are moderately deep or deep soils forming in colluvium, glacial till, or rhyolitic tuff, with an influence of volcanic ash in the upper solum. The Lithic Cryochrepts are well to somewhat excessively drained shallow soils formed in colluvium and residuum from glacially scoured granitic rocks with a component of volcanic ash. These soils are found in joints and crevices of rock outcrops and on ledges, benches, and sideslopes. The granitic rock is granodiorite and granodiorite porphyry.

Vegetation is uneven-aged lodgepole pine with grasses, sedges, and a few low shrubs such as ribes and chinquapin. Canopy cover is fair on the Typic Cryumbrepts and sparse on the Lithic Cryochrepts.

Included in this map unit are:

- 5% Lithic Cryorthents, sandy or sandy-skeletal, mixed, 5 to 30 percent slopes
- 5% Typic Cryorthents, sandy or sandy-skeletal, mixed, 5 to 30 percent slopes
- 4% Cryofluvents
- 1% Kettles and small ponds

60 Typic Xerumbrepts - Lithic Xerumbrepts - Jointed granitic outcrop complex, 30 to 60 percent slopes

The map unit is on extremely bouldery south-facing sideslopes of glacially scoured granitic mountains. There are 4 delineations in the vicinity of Fairview, Polly, and Lembert Domes.

- 45% Typic Xerumbrepts, loamy-skeletal, mixed, frigid, 30 to 60 percent slopes
- 30% Lithic Xerumbrepts, loamy, mixed, frigid, 30 to 60 percent slopes
- 20% Jointed granitic outcrop

The Typic Xerumbrepts are moderately deep, well drained soils forming in colluvium, till, and rhyolitic tuff over granodiorite. They are on slightly concave mid and lower sideslopes. The Lithic Xerumbrepts are shallow, well drained soils over granodiorite. They are associated with rock outcrop.

Vegetation is western juniper, Jeffrey pine, lodgepole pine, and chinquapin on the Typic Xerumbrepts. Manzanita, Phlox, and western juniper is characteristic of the Lithic Xerumbrepts.

Included with this unit are:

5% Lithic Cryochrepts loamy-skeletal, mixed, 30 to 60 percent slopes

70 Metamorphic talus - Lithic Cryochrepts - Jointed metamorphic outcrop complex, 45 to 75 percent slopes

The map unit has 3 delineations on the flanks of Gaylor Peak, and Mounts Dana and Gibb. This unit is on mountain ridges and sideslopes. The exposed brownish metamorphosed volcanic and sedimentary rock is high in quartz and pyroclastic material.

60% Metamorphic talus
15% Lithic Cryochrepts, loamy-skeletal, mixed, 45 to 75 percent slopes
15% Jointed metamorphic outcrop

The talus is composed of channers, flags, and stone-size fragments with less than 5 percent soil material. The Lithic Cryochrepts are shallow, somewhat excessively drained soils forming in colluvium and residuum from metamorphic rock. The outcrop consists of exposed, mainly vertically jointed metavolcanic or metasedimentary rock.

Vegetation is scattered, clumped and prostrate whitebark pine and sagebrush, with grass, sedges, phlox, and mountain heather.

Included with this unit are:

5% Lithic Cryorthents, loamy-skeletal, mixed, 5 to 45 percent slopes

5% Dystric Cryochrepts, loamy skeletal, mixed, 35 to 55 percent slopes

The Lithic Cryorthents are very shallow soils, mostly on exposed ridges and saddles. The Dystric Cryochrepts are deep soils on colluvial fans.

71 Metamorphic outcrop - Lithic Cryochrepts - Typic Cryumbrepts complex, 15 to 75 percent slopes

The map unit is located on mountain ridges, shoulders and sideslopes, along the contact between granitic and metamorphic rocks. There are 4 delineations near Gaylor Peak and above Parker Pass Creek.

60% Metamorphic outcrop
20% Lithic Cryochrepts, loamy, mixed, 25 to 75 percent slopes
15% Typic Cryumbrepts, loamy-skeletal, mixed, 15 to 40 percent slopes

The outcrop is mostly vertically jointed metavolcanic and metasedimentary rocks such as tuffs and hornfels. The Lithic Cryochrepts formed in residuum and colluvium from mostly metavolcanic rocks in cracks, fissures, and around rock outcrop. The Typic Cryumbrepts are mostly deep, well drained soils that formed in mixed colluvium from metamorphic and granitic rocks. They occur on concave benches and around bases of rock outcrops. Both soils also contain a component of volcanic ash.

Vegetation is scattered, stunted whitebark pine growing in shallow pockets of soil associated with rock outcrop. Grass and sedge out competes trees and shrubs on the deep soil on benches.

Included in this unit are:

4% Metamorphic talus
1% Cryofluvents and seeps

72 Metamorphic outcrop - Metamorphic talus - Typic Cryumbrepts complex, 35 to 130 percent slopes

There are 5 delineations of this map unit along the Sierra Crest. The unit is located on mountain ridges, shoulders, and sideslopes, mainly above tree-line.

35% Metamorphic outcrop, 45 to 130 percent slopes
30% Metamorphic talus, 45 to 75 percent slopes
25% Typic Cryumbrepts, loamy-skeletal, mixed, 35 to 50 percent slopes

The metamorphic rocks include volcanic tuffs and flows, shale, local graywackes, and calc-silicate hornfels. The talus consists of angular channers, flags, and boulders found below rock outcrop. The Typic Cryumbrepts formed in colluvium. They are well drained, deep and moderately deep soils.

Vegetation is mainly low growing shrubs like mountain heather, with phlox, buckwheat, and sedges. Scattered, stunted clumps of whitebark pine are also present.

Included in this map unit are:

10% Lithic Cryorthents, loamy-skeletal, mixed located around rock outcrops

80 Lithic Cryochrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 5 to 30 percent slopes

There are 3 delineations of this map unit that occurs on glacially scoured valley floors and plateaus.

40% Lithic Cryochrepts, loamy, mixed, 5 to 15 percent slopes
30% Jointed granitic outcrop
20% Typic Cryumbrepts, loamy-skeletal, mixed, 10 to 30 percent slopes

The Lithic Cryochrepts are well drained soils forming in a thin mantle of volcanic ash and glacial till over granodiorite. They are on ledges, benches, fissures, and joints on and around rock outcrop. The rock outcrop is sparsely jointed, glacially modified and mostly smooth with a gently rolling surface of exposed Cathedral Peak or Half Dome granodiorite. The Typic Cryumbrepts are mainly well drained, moderately deep soils forming in mixed colluvium, slopewash, glacial till, and volcanic ash, underlain by dense, compacted glacial till or volcanic tuff. They occur mainly in concave areas associated with larger joints. Areas along drainages and lower sideslopes are deep, moderately well drained, and have fewer coarse fragments.

Vegetation is uneven-aged lodgepole pine, grass, sedge, manzanita, sagebrush, and ribes. Canopy cover is about 10 percent on shallow soils, and about 25 to 50 percent on deeper soils.
Included in this map unit are:

5% Typic Cryorthents, sandy-skeletal, mixed, 5 to 30 percent slopes

5% Typic Cryofluvents, loamy-skeletal, mixed, 0 to 15 percent slopes. Poorly and somewhat poorly drained alluvial soils

81 Lithic Cryumbrepts - Dystric Cryochrepts - Jointed granitic outcrop complex, 30 to 55 percent slopes

The map unit is on glacially scoured shoulders and backslopes of granitic mountains. There are 9 delineations that occur in the western portion of the survey area.

35% Lithic Cryumbrepts, loamy, mixed, 30 to 55 percent slopes
25% Dystric Cryochrepts, loamy-skeletal, mixed, 30 to 55 percent slopes
25% Jointed granitic outcrop

The Lithic Cryumbrepts are well to somewhat excessively drained soils formed in colluvium and residuum from granitic rocks with an influence of volcanic ash. They occupy ledges, benches, rock fissures, and steep slopes in complex association with rock outcrop. The Dystric Cryochrepts are moderately deep and deep, moderately well to well drained soils. They formed in colluvium and residuum from granitic rocks, granitic glacial till, weathered tuff, and volcanic ash. They occupy concave positions in small drainageways, and are on benches, sideslopes, and colluvial fans. The rock outcrop is Half Dome and Cathedral Peak granodiorite.

Vegetation is uneven-aged lodgepole pine. The canopy varies from 5 to 15 percent on Lithic Soils in association with rock outcrop, to 25 to 50 percent on deeper soils in concave positions. The understory includes fescue and sedges, with ribes, manzanita, and sagebrush.

Included with this unit are:

10% Lithic Cryumbrepts, loamy-skeletal, mixed, 30 to 55 percent slopes
4% Lithic Cryorthents, sandy-skeletal, mixed, 30 to 55 percent slopes
1% Cryofluvents

82 Lithic Cryochrepts - Jointed granitic outcrop complex, 5 to 30 percent slopes

There are 4 delineations of this map unit near the northern survey boundary below Ragged Peak and White Mountain. The unit is on glacially scoured cirque basins.

60% Lithic Cryochrepts, loamy, mixed, 5 to 30 percent slopes
20% Jointed granitic outcrop

The Lithic Cryochrepts formed in thin layers of residuum and glacial till overlying scoured, sparsely jointed granodiorite. The surface is usually extremely bouldery.

Vegetation is small stands of lodgepole and whitebark pine with sedge, phlox, and buckwheat.

Included in this unit are:

10% Sandy-skeletal soils, Lithic and Typic Cryorthents, mixed, 5 to 30 percent slopes
10% Typic Cryumbrepts, loamy-skeletal, mixed, 5 to 30 percent slopes

90 Dystric Cryochrepts - Typic Cryumbrepts - metamorphic talus complex, 45 to 75 percent slopes

This map unit has 2 delineations on extremely stony, unstable, middle and lower sideslopes below Mount Dana and Mount Gibbs.

- 40% Dystric Cryochrepts, loamy-skeletal, mixed, 45 to 65 percent slopes
- 25% Typic Cryumbrepts, loamy-skeletal, mixed, 45 to 65 percent slopes
- 20% Metamorphic talus, 50 to 75 percent slopes

The Dystric Cryochrepts are deep, well drained soils found on lower convex sideslopes. The Typic Cryumbrepts are on upper and middle sideslopes. Both soils are deep and well drained, forming in colluvium and volcanic ash. The talus is composed of flags, channers, stones, and boulders from metamorphic rocks such as volcanic tuffs, quartzite, and calc-silicate hornfels.

Vegetation is mainly lodgepole pine on lower sideslopes and whitebark pine on upper sideslopes, with sedges and grasses.

Included in this unit are:

- 5% Metamorphic outcrop
- 10% Pachic Cryoborolls, loamy-skeletal, mixed, 45 to 60 percent slopes

The Pachic Cryoborolls have thick dark surfaces, are somewhat poorly drained, and occur on lower concave sideslopes in association with seeps.

91 Dystric Cryochrepts, 15 to 60 percent slopes

This map unit has 2 delineations located on backslopes and footslopes of the glacially carved Parker Pass Creek valley. The complex dissected and benched morainal slopes are mostly 25 to 45 percent, but slope limits widened to accommodate benches and steep dissections. Surface is very stony to extremely bouldery.

85% Dystric Cryochrepts, loamy-skeletal, mixed, 15 to 60 percent slopes

These are well drained, deep and moderately deep soils forming in colluvium and glacial till, with the influence of volcanic ash. Rock fragments are from mixed granitic and metamorphic sources. On lower sideslopes and benches, a dense, brittle till pan may occur between 20 to 40 inches.

Vegetation is predominantly lodgepole pine with minor amounts of mountain hemlock and whitebark pine on upper slopes. Understory is mostly grasses, sedges, and ribes.

Included with this unit are:

5% Metamorphic rock outcrop
10% Typic Cryumbrepts, loamy-skeletal, mixed, 20 to 45 percent slopes.

100 Dystric Cryochrepts, 15 to 45 percent slopes

There are 6 delineations of this map unit. They occur on more or less northerly slopes on extremely bouldery dissected lateral moraines and sideslopes of granitic mountains.

80% Dystric Cryochrepts, loamy-skeletal, mixed, 15 to 45 percent slopes

These soils are well drained, forming in colluvium and residuum from granitic rocks, glacial till, and influenced by volcanic ash in the upper solum. They may be deep in glacial till, but commonly are moderately deep over granodiorite or dense till pan.

Vegetation is primarily lodgepole pine with mountain hemlock and minor western white pine. Understory is grass, sedges, and ribes. Canopy cover varies from 35 to 65 percent.

Included in this map unit are:

10% Typic Cryumbrepts, loamy-skeletal, mixed, 15 to 45 percent slopes
5% Sandy-skeletal, Typic Cryorthents and Dystric Cryochrepts, 15 to 45 percent slopes
3% Cryofluvents, wet meadows, and Pachic Cryoborolls along drainages and seeps
2% Granitic rock outcrop or rubbleland from landslides

101 Dystric Cryochrepts - Jointed granitic outcrop - Lithic Cryochrepts complex, 40 to 75 percent slopes

This map unit has 11 delineations that occur on the upper timbered sideslopes of granitic mountains.

40% Dystric Cryochrepts, loamy-skeletal, mixed, 40 to 75 percent slopes
25% Jointed granitic outcrop
15% Lithic Cryochrepts, loamy, mixed, 40 to 75 percent slopes

The Dystric Cryochrepts are deep, well drained soils forming in colluvium, glacial till, and volcanic ash, which are underlain by granodiorite. They occur on slightly concave sideslopes with very bouldery surfaces. The Lithic Cryochrepts are formed in the same material and occur between rock joints and crevices.

Vegetation is whitebark pine and lodgepole pine, with sedges, ribes, mountain heather, and mountain sagebrush.

Included in this map unit are:

10% Typic Cryumbrepts and Lithic Cryumbrepts, loamy-skeletal, mixed, 40 to 75 percent slopes
7% Granitic talus
3% Cryofluvents, 15 to 35 percent slopes

102 Dystric Cryochrepts - Aeric Cryaquepts complex, 0 to 15 percent slopes

This map unit is on hummocky, alpine meadows at elevations above 9400 feet. The unit is characterized by morainal ridges and depressions, often dotted with large boulders, and a number of small lakes or kettles are prominent. The unit has 9 delineations.

65% Dystric Cryochrepts, loamy-skeletal and coarse-loamy, mixed, 5 to 15 percent slopes

20% Aeric Cryaquepts, fine-loamy, mixed, 0 to 10 percent slopes

The Dystric Cryochrepts are moderately deep to a brittle till pan. They are moderately well drained soils forming on convex slopes

and ridges of morainal deposits. Commonly, these soils contain many rock fragments (>35%) in the profile and the surface is very stony to extremely bouldery. Less commonly, the soil profile averages 15 to 35 percent rock fragments, and it may be somewhat poorly drained in areas adjacent to depressions. The Aeric Cryaquepts are poorly and very poorly drained soils in depressions and along drainageways. They are also underlain by a hardpan and are moderately deep. The morainal deposits are primarily granitic, but metamorphic rocks influence the till along Parker Pass Creek.

Vegetation is mainly water tolerant sedges and grasses, but includes encroaching whitebark and lodgepole pine, and willow on wetter sites.

Included in this unit are:

- 5% Sandy-skeletal, mixed Typic Cryorthents and Dystric Cryochrepts
- 5% Sandy-skeletal, mixed Typic Cryofluvents
- 5% Small lakes and ponds

The sandy-skeletal Typic Cryorthents and Dystric Cryochrepts are found on coarse poorly sorted outwash and morainal deposits. The Typic Cryofluvents are along drainageways and creeks.

<u>110 Typic Cryofluvents, 0 to 5 percent slopes</u>

There are 5 delineations of this map unit. These are the wet alluvial areas of Tuolomne and Dana Meadows. They are on glacially eroded valley floors.

70% Typic Cryofluvents, coarse-loamy, mixed, 0 to 5 percent slopes

20% Typic Cryofluvents, sandy-skeletal, mixed, 0 to 3 percent slopes

These are the very deep, somewhat poorly to poorly drained soils forming in Holocene valley fill material in glaciated sub-alpine meadow areas. The material ranges from loamy to very coarse and depth to sand and gravel ranges from 12 to greater than 60 inches.

Vegetation is grasses, sedges, and hydrophilic plants. Lodgepole pine is often encroaching on the better drained meadow edges. Included in this unit are:

5% Humic and Aeric Cryaquepts, fine-loamy, mixed, 0 to 2 percent slopes

3% Granitic outcrop (especially western Tuolomne Meadows)

2% Streams and channels

W Lakes and Other Water Bodies

This miscellaneous unit has 14 delineations. These are kettles or tarns of 5 acres or more that are all associated with glacial scouring and depositions.

Examples are Tenaya, Dog, Polly, Cathedral, and Helen Lakes.

SOIL SURVEY OF
DOUGHERTY PEAK STUDY AREA
KINGS CANYON NATIONAL PARK

DESCRIPTION OF THE AREA

LOCATION

The Dougherty Peak study area encompasses approximately 25,000 acres within the west-central portion of the Kings Canyon National Park (Marion Peak 15' quadrangle. Located within the Sierra Nevada of California, the study area lies between the coordinates of latitudes 36^0 48' and 37^0 00' north and longitudes 118^0 31' and 118^0 38' west.

The Kings River forms the northern boundary; Murray Ridge, Cirque Crest, and Goat Crest the east boundary; and Dead Pine Ridge the west boundary. The southern boundary begins at Kennedy Pass, continues east along Comb Spur before crossing Granite Basin and continuing north to Goat Crest. The Dougherty Peak study area is located in southeastern Fresno County.

TERRAIN

The complex terrain is characterized by deeply incised canyons, glacial basins and valleys, mountain summits, cirques, and tarns. The terrain is very rugged with elevations ranging from 5,900 to 12,600 feet. The topography is predominantly complex with very steep to extremely steep slopes. The terrain reflects the land-forming influence of extensive glaciation so characteristic of the High Sierra. Cirque lakes, deeply incised basins and expanses of exposed granitic peaks and walls are common features.

GENERAL GEOLOGY

Typical of the western slope of the Southern Sierra Nevada, Cretaceous age granite, granodiorite, and similar acid-igneous rocks comprise the vast majority of the Dougherty Peak study area. Remnant mafic plutonic and metavolcanic rocks (Mesozoic) occur as small islands south and east of State Lakes, along the southeast corner of Dead Pine Ridge and around Windy Peak.

The area has been heavily glaciated. Only a few small alpine peaks and summits occurring at elevations of 11,000 feet or higher remain unglaciated. The glaciers left relatively little debris behind them. This is supported by the large amount of shallow soils in this area. Many traces of past glaciation remain including the presence of moraines, erratic boulders, chain lakes, cirques, tarns, and glacial polish on rocks.

VEGETATION

The natural vegetation reflects the soil and climatic patterns of the area. There are six communities in this area:

- Mountain Chaparral
- Jeffrey Pine Forest
- Red Fir Forest
- Lodgepole Pine Forest
- Subalpine Forest
- Subalpine and Alpine Meadow

The Mountain Chaparral and Jeffrey Pine Forest communities occupy the lowest and warmest areas, elevation from 5,900 feet to 8,000 feet on the warmer aspects. Wildfires are common. Brush thickets composed of plants such as snow brush, bitter cherry, manzanita, sagebrush, chinquapin and canyon oak comprise the mountain chaparral community. They occupy dry and rocky slopes often in

association with talus. The soils are predominantly shallow and skeletal, commonly having well developed subsoils. Jeffrey pine along with black oak, incense cedar, sugar pine, white fir and western juniper make up the primary plants in the Jeffrey Pine Forest. This community often has a shrub understory. The soils tend to be moderately deep and deep, and typically skeletal and coarse textured.

Red Fir Forest community occurs on cool, well drained soils at elevations from 7,000 to 9,000 feet. They occur in even-aged stands with few associates. The sites they occupy often receive high amounts of snowfall.

The largest community in the survey area is the Lodgepole Forest. It ranges from 8,000 to 11,000 feet and occurs on glacially scoured ridges, valleys and basins and lower mountain sideslopes. The soils are cold and normally poorly developed but range greatly in depth. Typically the understory is sparse and consequently, litter accumulation is low.

The next higher community, the Subalpine Forest, is found on rocky mountain ridges, crests and sideslopes at elevations from 9,500 to 12,000 feet. The trees appear stunted and sparsely scattered. They include lodgepole pine, western white pine, and whitebark pine with very little understory or litter. Soils are shallow and very shallow.

The highest community, the Alpine Community, occurs on the upper glacial basins and upper mountain ridges and sideslopes above timberline. Plants are low growing and consist of alpine herbs such as pussypaws, dwarf Lewisia, buckwheat, and shrubs such as currant and willow. Soils are very shallow and shallow and very cold.

The last community is the Subalpine and Alpine Meadows. They are dominated by various species of sedges, meadow grasses, and willows. Soils are mostly deep and are very poorly and poorly drained.

TABLE 1-KC

SOIL TAXONOMIC UNITS
(Alphabetical order)

Dougherty Peak Study Area

Kings Canyon National Park

Entic Xerumbrepts, loamy-skeletal, mixed, mesic
Humic Cryaquepts, sandy-skeletal, mixed
Lithic Cryumbrepts, loamy-skeletal, mixed
Lithic Cryumbrepts, sandy-skeletal, mixed
Lithic Mollic Haploxeralfs, loamy-skeletal, mixed, frigid
Lithic Xerorthents, sandy-skeletal, mixed, frigid
Lithic Xerumbrepts, loamy-skeletal, mixed, frigid
Lithic Xerumbrepts, loamy-skeletal, mixed, mesic
Typic Cryofluvents, sandy, mixed
Typic Cryorthents, sandy-skeletal, mixed
Typic Cryorthents, sandy-skeletal, mixed, shallow
Typic Cryumbrepts, loamy-skeletal, mixed
Typic Xerumbrepts, loamy-skeletal, mixed, frigid

TABLE 2-KC

CLASSIFICATION TABLE OF TAXONOMIC UNITS

Dougherty Peak Study Area

Kings Canyon National Park

ALFISOLS

Haploxeralfs

Lithic Mollic Haploxeralfs, loamy-skeletal, mixed, frigid

ENTISOLS

Cryofluvents

Typic Cryofluvents, sandy, mixed

Cryorthents

Typic Cryorthents, sandy-skeletal, mixed
Typic Cryorthents, sandy-skeletal, mixed, shallow

Xerorthents

Lithic Xerorthents, loamy-skeletal, mixed, frigid

INCEPTISOLS

Cryaquepts

Humic Cryaquepts, sandy-skeletal, mixed

Cryumbrepts

Typic Cryumbrepts, loamy-skeletal, mixed
Lithic Cryumbrepts, loamy-skeletal, mixed
Lithic Cryumbrepts, sandy-skeletal, mixed

Xerumbrepts

Typic Xerumbrepts, loamy-skeletal, mixed, frigid
Entic Xerumbrepts, loamy-skeletal, mixed, mesic
Lithic Xerumbrepts, loamy-skeletal, mixed, mesic
Lithic Xerumbrepts, loamy-skeletal, mixed, frigid

TAXONOMIC UNITS IN THE DOUGHERTY PEAK STUDY AREA

DESCRIPTION OF TAXONOMIC UNITS

Entic Xerumbrepts, loamy-skeletal, mixed, mesic

This soil family consists of moderately deep and deep, somewhat excessively drained soils that formed in colluvium from granitic rock sources. They occur on canyon sideslopes. Slopes range from 45 to 75 percent slopes.

These soils are poorly developed and have moderately coarse textures. Typically they have a moderately thick dark colored surface layer over a lighter colored substratum.

Following is a profile description of a representative pedon (88-2K-27) found in the map unit *29 Jointed dacitic outcrop - Lithic Xerumbrepts - Typic Xerumbrepts complex, 45 to 130 percent slopes.* It is located near the Simpson Meadow about 1 mile southwest of Windy Peak on the Marion Peak 15' quadrangle. Elevation is approximately 6700 feet.

Oi--0.5 to 0 inches; slightly decomposed conifer needles and shrubs leaves and twigs.

A1--0 to 5 inches; brown (10YR 4/3) very stony coarse sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; soft very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 30 percent pebbles, 10 percent cobbles, and 10 percent stones; abrupt wavy boundary.

AC--5 to 19 inches; yellowish brown (10YR 5/4) very cobbly coarse sandy loam, dark brown (10YR 3/3) moist; weak very fine and fine subangular blocky structure; common very fine, fine and medium roots; common very fine and fine interstitial pores; 20 percent pebbles, 20 percent cobbles, and 10 percent stones; clear wavy boundary.

C--19 to 42 inches; yellowish brown (10YR 5/4) very cobbly coarse sandy loam, brown (10YR 4/3) moist; massive; few fine and medium roots; common very fine and medium interstitial pores; 20 percent pebbles, 30 percent cobbles, and 10 percent stones.

Remarks: About a third of the soils surfaces have litter on them. The soil temperature taken at 20 inches on 7/13/88 at 1:00 p.m. was 68^0F.

Humic Cryaquepts, sandy-skeletal, mixed

This soil family consists of deep, very poorly and poorly drained soils that formed in alluvium and some morainal material weathered from granitic rock sources. They occur on drainageways and around seeps. Slopes range from 5 to 15 percent.

Typically they have very dark colored surface layers over lighter colored stratified substratums that are frequently mottled.

Following is a profile description of a representative pedon (88-2K-04) found on map unit *90 Humic Cryaquepts-Typic Cryofluvents complex, 0 to 15 percent slopes.* It is located north of Glacier Lakes about 7,054 feet S20^0E of bench mark (BM) 9652 on the Marion Peak Quadrangle, USGS (photo 7-222). The elevation is 32,710 m (9,970 feet), 15 percent slope on a southeast aspect.

Oa--0 to 9 inches; dark gray (10YR 4/1) "silty" muck held together by many very fine and fine roots, very dark brown (10YR 2/2) moist; structureless; friable, slightly sticky and slightly plastic; many very fine interstitial pores; abrupt wavy boundary.

A--9 to 12 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; massive; many very fine roots; many very fine interstitial pores; abrupt wavy boundary.

2Cg--12 to 23 inches; gray (5Y 5/1) gravelly coarse sandy loam, dark gray (5Y 4/1) moist; massive; friable, nonsticky and nonplastic; common very fine interstitial pores; gradual wavy boundary.

3Cg--23 to 60 inches; gray (5Y 5/1) extremely cobbly coarse sand, dark gray (5Y 4/1) moist, few medium distinct yellowish brown (10YR 5/6) iron mottles; single grained; loose, loose, nonsticky and nonplastic; 15 percent pebbles, 40 percent cobbles, and 10 percent stones.

Remarks: The water table was at 25 inches on 7/5/88.

Lithic Cryumbrepts, loamy-skeletal, mixed

This soil map unit consists of very shallow and shallow, well and somewhat excessively drained soils that formed in residuum and some colluvium weathered from granitic rock sources.

Typically they have a dark surface layer over a brighter (higher chroma) subsoil resting over granitic rock.

Following is a profile description of a representative pedon (88-2K-17) found in the map unit *22 Jointed granitic outcrop* -

Lithic Cryumbrepts complex, 15 to 45 percent slopes. It is located north of Granite Lake about 0.5 mile south of Granite Pass on the Marion Peak 15' quadrangle. Elevation is approximately 10200 feet.

Oi--0.5 to 0 inches; slightly decomposed conifer needles, twigs and cones.

A1--0 to 4 inches; very dark grayish brown (10YR 3/2) extremely bouldery coarse sandy loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 20 percent pebbles, 15 percent cobbles, 15 percent stones, and 20 percent boulders; abrupt wavy boundary.

A2--4 to 11 inches; dark yellowish brown (10YR 3/4) extremely stony coarse sandy loam, dark yellowish brown (10YR 3/4) moist; moderate very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 15 percent pebbles, 15 percent cobbles, 20 percent stones, and 15 percent boulders; abrupt wavy boundary.

A3--11 to 18 inches; dark yellowish brown (10YR 4/4) extremely stony coarse sandy loam, dark yellowish brown (10YR 3/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very and fine roots; common fine and medium pores; 10 percent pebbles, 30 percent cobbles, 30 percent stones, and 20 percent boulders; abrupt wavy boundary.

2R--18 inches; fractured granitic rock.

Remarks: The soil temperature taken at 18 inches on 7/9/88 at 10:00 a.m. was 60^0F.

Lithic Cryumbrepts, sandy-skeletal, mixed

This soil family consists of very shallow and shallow, excessively drained soils that formed in residuum and colluvium from granitic rock sources. They occur on unglaciated canyon sideslopes. Slopes range from 45 to 75 percent slopes.

Typically they have a dark surface layer resting on top of hard granitic rock.

Following is a profile description of a representative pedon (88-2K-20) found in the map unit *110 Lithic Cryumbrepts - Lithic Xerorthents - Jointed granitic outcrop complex, 45 to 75 percent slopes.* It is located near Windy Peak about 1.5 miles southeast of Simpson Meadow on the Marion Peak 15' quadrangle. Elevation is approximately 8400 feet.

Oi--0.5 to 0 inches; slightly decomposed conifer needles, twigs and cones.

A1--0 to 3 inches; brown (10YR 5/3) extremely gravelly loamy coarse sand, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; common very fine roots; common very fine interstitial pores; 65 percent pebbles, 5 percent cobbles; clear wavy boundary.

A2--3 to 7 inches; brown (10YR 5/3) extremely gravelly loamy coarse sand, dark brown (10YR 3/3) moderate fine and medium subangular blocky structure; many very fine

and common fine roots; common very fine interstitial pores; 60 percent pebbles, 5 percent cobbles; clear wavy boundary.

C--7 to 13 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine and medium roots; common very fine interstitial pores; 50 percent pebbles, 5 percent cobbles; abrupt wavy boundary.

2R--13 inches; hard, fractured granitic rock.

Remarks: The soil temperature taken at 13 inches on 7/12/88 was 59^0F.

Lithic Mollic Haploxeralfs, loamy-skeletal, mixed, frigid

This soil family consists of very shallow and shallow, well drained soils that formed in residuum and colluvium from granitic rock sources. They occur on canyon sideslopes around jointed granitic outcrop. Slopes range from 45 to 75 percent.

Typically these soils have dark colored layers and a well developed subsoil that rests on granite.

Following is a profile description of a representative pedon (88-2K-24) found in the map unit *60 Lithic Xerumbrepts - Lithic Mollic Haploxeralfs - Typic Xerumbrepts complex, 45 to 75 percent slopes.* It is located 1.5 miles northeast of Windy Peak on the north-northwest facing slopes of Windy Ridge on the Marion Peak 15' quadrangle. Elevation is approximately 8,000 feet.

A1--0 to 2 inches; grayish brown (10YR 5/2) extremely gravelly coarse sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; 45 percent pebbles, 20 percent cobbles, and 5 percent stones; clear wavy boundary.

A2--2 to 6 inches; grayish brown (10YR 5/2) very cobbly coarse sandy loam, very dark brown (10YR 2/2) moist, weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial and few fine tubular pores; 20 percent pebbles, 20 percent cobbles, and 10 percent stones; abrupt wavy boundary.

Bt--6 to 10 inches; brown (10YR 5/3) cobbly loam, brown (10YR 3/3) moist; moderate medium and coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; common thin clay films on ped faces and few moderately thick clay films lining pores; 10 percent pebbles, 15 percent cobbles, and 5 percent stones; abrupt smooth boundary.

2R--10 inches; hard granitic rock.

Remarks: The Bt horizon has 18 to 27 percent clay.

Lithic Xerorthents, sandy-skeletal, mixed, frigid

This soil family consists of very shallow and shallow, excessively drained soils that formed in colluvium and residuum from granitic

rock sources. They occur on unglaciated canyon sideslopes. Slopes range from 45 to 75 percent slopes.

These soils are little developed. They have light colored coarse textured layers over granitic rock.

Following is a profile description of a representative pedon (88-2K-23) found in the map unit *110 Lithic Cryumbrepts - Lithic Xerorthents - Jointed granitic outcrop complex, 45 to 75 percent slopes.* It is located east of Dougherty Creek about 1.5 miles southeast of Simpson Meadow on the Marion Peak 15' quadrangle. Elevation is approximately 7800 feet.

A1--0 to 2 inches; light brownish gray (10YR 6/2) extremely gravelly coarse sandy loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial pores; 65 percent pebbles; abrupt wavy boundary.

C1--2 to 12 inches; very pale brown (10YR 7/2) extremely gravelly loamy coarse sand, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; common very fine roots; many very fine interstitial pores; 60 percent pebbles; clear wavy boundary.

2Cr--12 to 16 inches; granitic grus.

2R--16 inches; hard granitic rock.

Remarks: Depth to rock ranges from 4 to 16 inches. A thin layer of grus is commonly present. Coarse fragments are mainly small pea size pebbles. The soil temperature taken at 12 inches on 7/14/88 was 67^0F.

Lithic Xerumbrepts, loamy-skeletal, mixed, frigid

This soil family consists of shallow, somewhat excessively drained soils that formed in colluvium and residuum weathered from granitic rock sources. They occur on rocky crests and ridges of canyons. Slopes range from 15 to 75 percent.

These soils have moderately coarse textures. They have a dark surface layer overlying a lighter colored and brighter chroma subsoil which rests on granitic rock.

Following is a profile description of a representative pedon (88-2K-26) found in the map unit *60 Lithic Xerumbrepts - Lithic Mollic Haploxeralfs - Typic Xerumbrepts complex, 45 to 75 percent slopes.* It is located northeast of Windy Peak on the north-northwest facing slopes of Windy Ridge on the Marion Peak 15' quadrangle. Elevation is approximately 8600 feet.

Oi--2 to 0 inches; slightly decomposed manzanita and canyon live oak leaves and conifer needles.

A1--0 to 3 inches; dark grayish brown (10YR 4/2) very cobbly coarse sandy loam, very dark brown (10YR 2/2) moist; weak very fine granular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few medium and coarse roots; common very fine interstitial pores; 15 percent pebbles, 20 percent cobbles, and 10 percent stones; clear wavy boundary.

A2--3 to 7 inches; grayish brown (10YR 5/2) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak moderate subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few medium and coarse roots;

common very fine interstitial and tubular pores; 25 percent pebbles, 20 percent cobbles, and 15 percent stones; clear wavy boundary.

Bw--7 to 17 inches; pale brown (10YR 6/3) very cobbly coarse sandy loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine tubular pores; 25 percent pebbles, 20 percent cobbles, and 15 percent stones; abrupt wavy boundary.

2R--17 inches; fractured granitic rock.

Remarks: Depth to bedrock ranges from 10 to 20 inches. About a third of these soils have a litter cover.

Lithic Xerumbrepts, loamy-skeletal, mixed, mesic

This soil family consists of very shallow and shallow to granitic rock, somewhat excessively drained soils that formed in residuum and some colluvium weathered from granitic rock sources. They occur on rocky crests and ridges of canyons and glacial basin sideslopes. Slopes range from 45 to 75 percent.

Typically these soils have a dark colored soil surface layer over a brighter chroma subsoil, in turn resting on hard granitic rock.

Following is a profile description of a representative pedon (88-2K-28) found in the map unit *29 Jointed dacitic outcrop - Lithic Xerumbrepts - Typic Xerumbrepts complex, 45 to 130 percent slopes.* It is located south of the Simpson Meadow about 1 mile southwest of Windy Peak on the Marion Peak 15' quadrangle. Elevation is approximately 6500 feet.

Oi--0.5 to 0 inches; slightly decomposed conifer needles and oak leaves, twigs and grass.

A1--0 to 4 inches; brown (10YR 5/3) extremely gravelly coarse sandy loam, very dark brown (10YR 2/2) moist; moderate fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and medium interstitial pores; 55 percent pebbles, 15 percent cobbles, and 10 percent stones; abrupt wavy boundary.

A2--4 to 10 inches; brown (10YR 5/3) extremely cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky parting to moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very fine, fine and medium interstitial pores; 45 percent pebbles, 15 percent cobbles, and 10 percent stones; abrupt wavy boundary.

Bw--10 to 15 inches; yellowish brown (10YR 5/4) extremely cobbly coarse sandy loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, friable, nonsticky and nonplastic; common very fine and fine and few medium roots; common very fine, fine and coarse interstitial pores; abrupt wavy boundary.

2R--15 inches; hard, fracture slightly metamorphosed granitic rock.

Remarks: The soil temperature taken at 15 inches on 7/13/88 at 3:00 p.m. was 62^{0}F.

Typic Cryofluvents, sandy, mixed

This soil family consists of deep, moderately well drained soils that formed in alluvium, colluvium and some morainal material weathered from granitic rock sources. They occur on stream outwash deposits in glacial basins. Slopes range from nearly level to 10 percent.

Typically they have stratified light and slightly dark alluvial layers of coarse textures.

Following is a profile description of a representative pedon (88-2K-18) found in the map unit *90 Humic Cryaquepts - Typic Cryofluvents complex, 0 to 15 percent slopes.* It is located southeast of the Lake of the Fallen Moon about one mile northwest of Glacial Lakes, on the Marion Peak 15' quadrangle. Elevation is approximately 9500 feet.

Oi--1 to 0 inches; slightly decomposed conifer needle, twigs and cones.

A1--O to 4 inches; brown (10YR 5/3) gravelly coarse sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; common very fine and fine tubular pores; 15 percent pebbles; abrupt wavy boundary.

A2--4 to 8 inches; pale brown (10YR 6/3) gravelly coarse sand, dark brown (10YR 3/3) moist; weak very fine and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine, fine and few medium roots; common very fine and fine tubular pores; 20 percent pebbles; abrupt boundary.

2C--8 to 15 inches; light yellowish brown (10YR 6/4) very gravelly loamy coarse sand, brown (10YR 3/3) moist; single grained; loose, loose, nonsticky and nonplastic; few fine and medium roots; common very fine and fine interstitial pores; 40 percent pebbles; abrupt wavy boundary.

3Abg--15 to 31 inches; yellowish brown (10YR 5/4) gravelly loamy sand, brown (10YR 4/3) moist; moderate fine, medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many medium distinct dark yellowish brown (10YR 4/6) iron mottles; common fine and medium roots; common very fine and fine tubular pores; 15 percent pebbles; abrupt wavy boundary.

4C--31 to 40 inches; light yellowish brown (10YR 6/4) very gravelly coarse sand, dark yellowish brown (10YR 4/4) moist; single grained; loose, loose, nonsticky and nonplastic; few very fine interstitial pores; 35 percent pebbles; abrupt wavy boundary.

5C--40 to 62 inches; stratified silt loam to very gravelly coarse sand; massive to single grained; friable to loose.

Remarks: The soil has a very thin ash layer at 3 inches. The soil temperature taken at 20 inches on 9/11/88 was 46^0F.

Typic Cryorthents, sandy-skeletal, mixed

This soil family consists of moderately deep to granitic rock, excessively drained soils that formed in colluvium and morainal material weathered from granitic rock sources. They occur on

scoured glacial basins and glaciated and unglaciated mountain sideslopes. Slopes range from 15 to 45 percent.

Typically it has a thin slightly darkened surface layer over a light colored substratum.

Following is a profile description of a representative pedon (88-2K-10) found in the map unit *40 Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.* It is located on the Dead Pine Ridge about one mile northeast of West Kennedy Lake, on the Marion Peak 15' quadrangle. Elevation is approximately 9800 feet.

Oi--1 to 0 inches; slightly decomposed conifer needles, twigs and cones.

A1--0 to 4 inches; grayish brown (10YR 5/2) very gravelly loamy sand, dark brown (10YR 3/3) moist; weak very fine subangular and granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots, common very fine and fine interstitial pores; 40 percent pebbles and 5 percent cobbles; abrupt smooth boundary.

A2--4 to 9 Inches; grayish brown (10YR 5/2) gravelly loamy sand, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine interstitial pores; 20 percent pebbles and 5 percent cobbles; abrupt smooth boundary.

C--9 to 40 inches; light olive brown (2.5Y 5/4) very gravelly coarse sand, olive brown (10YR 4/4) moist;

single grained; loose, loose, nonsticky and non-plastic; few fine and medium roots; few very fine interstitial pores; 40 percent pebbles and 10 percent cobbles.

Typic Cryorthents, sandy-skeletal, mixed, shallow

This soil family consists of very shallow and shallow, excessively drained soils that formed in residuum and some colluvium from weathered granitic rock sources. They occur on unglaciated mountain sideslopes and ridges and on glacial basin sideslopes. Slopes range from 15 to 45 percent.

Typically they are light colored soil horizons over soft granitic rock or grus. Textures are coarse.

Following is a profile description of a representative pedon (88-2K-07) found in the map unit *10 Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.* It is located north of the Glacial Lakes about 0.5 mile west of Glacier Valley on the Marion Peak 15' quadrangle. Elevation is approximately 10400 feet. The slope faces southwest.

(The soil surface is covered by 80 percent pea-size pebbles).

A--0 to 3 inches; light brownish gray (10YR 6/2) extremely gravelly loamy coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, loose, nonsticky and nonplastic; few very fine and fine roots; common very fine interstitial pores; 65 percent pebbles; abrupt wavy boundary.

C--3 to 7 Inches; light brownish gray (10YR 6/2) extremely gravelly coarse sand, grayish brown (10YR 5/2) moist; single grained; loose, loose, nonsticky

and nonplastic; few fine and medium roots; few very fine interstitial pores; 70 percent pebbles; abrupt wavy boundary.

2Cr--7 to 25 inches; light gray (10YR 7/2) granitic grus; can be excavated by hand with difficulty.

3R--25 inches; hard, slightly fractured granite.

Remarks: Depth to paralithic contact varies from 4 to 20 inches.

Typic Cryumbrepts, loamy-skeletal, mixed

This soil family consists of moderately deep to granitic rock, well drained soils that formed in residuum and colluvium weathered from granitic rock sources. They occur on glacial basin floors. Slopes range from 5 to 35 percent.

Typically they have dark surface layers overlying a brighter chroma subsoil. The subsoil rests upon granitic rock.

Following is a profile description of a representative pedon (88-2K-13) found in the map unit *50 Lithic Cryumbrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 15 to 35 percent slopes.* It is located in the Volcanic Lakes area about 1 mile southeast of Lake of the Fallen Moon on the Marion Peak 15' quadrangle. Elevation is approximately 9500 feet.

Oi--0.5 to 0 inches; slightly decomposed conifer needles, twigs and cones.

A1--0 to 3 inches; very dark gray (10YR 3/1) extremely boundary coarse sandy loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very

fine and fine roots; common very fine and interstitial pores; 25 percent pebbles, 10 percent cobbles, 20 percent stones, and 20 percent boulders; abrupt wavy boundary.

A2--3 to 8 inches; dark brown (10YR 3/3) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine interstitial pores; 15 percent pebbles and 20 percent cobbles; abrupt wavy boundary.

Bw1--8 to 15 inches; dark yellowish brown (10YR 3/4) very cobbly sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common very fine and fine interstitial pores; 15 percent pebbles and 30 percent cobbles; clear wavy boundary.

Bw2--15 to 21 inches; light yellowish brown (10YR 6/4) very cobbly sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common very fine and fine interstitial pores; 25 percent pebbles and 30 percent cobbles; abrupt wavy boundary.

2C--21 to 28 inches; dark yellowish brown (10YR 4/6) very gravelly loamy sand, dark yellowish brown (10YR 3/6) moist; single grained; loose, loose, nonsticky and nonplastic; few fine and medium

roots; 25 percent pebbles and 15 percent cobbles; abrupt smooth boundary.

2R--28 inches; hard, granitic rock.

Remarks: The soil temperature taken at 20 inches on 7/6/88 was 49^0F.

Typic Xerumbrepts, loamy-skeletal, mixed, frigid

This soil family consists of moderately deep to rock, somewhat excessively drained soils that formed in colluvium and morainal material weathered from granitic rocks. They occur on canyon sideslopes. Slopes range from 15 to 75 percent slopes.

Typically they have a dark surface layer overlying a lighter colored, higher chroma subsoil. The subsoil, in turn, rests on granitic rock.

Following is a profile description of a representative pedon (88-2K-25) found in the map unit *60 Lithic Xerumbrepts - Lithic Mollic Haploxeralfs - Typic Xerumbrepts complex, 45 to 75 percent slopes.* It is located 1.5 miles northeast of Windy Peak on the northwest-facing slopes of Windy Ridge on the Marion Peak 15' quadrangle. Elevation is approximately 8000 feet.

Oi--2 to 0 inches; slightly decomposed conifer needles, bark and twigs, and manzanita leaves.

A1--0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly fine sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky parting to moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and common fine and medium roots; common very

fine interstitial pores; 40 percent pebbles, 5 percent cobbles, and 10 percent stones; clear wavy boundary.

A2--3 to 8 inches; brown (10YR 5/3) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; common very fine and fine interstitial pores; 30 percent peb bles, 10 percent cobbles, and 5 percent stones; clear wavy boundary.

Bw--8 to 21 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and few medium and coarse roots; common very fine and fine tubular pores; 20 percent pebbles, 15 percent cobbles, and 5 percent stones; abrupt wavy boundary.

2R--21 inches; hard, fractured granitic rock.

Remarks: The cambic horizon (Bw) generally has a little more clay than the A horizon but not quite enough for an argillic.

TABLE 3-KC

MAP UNIT LEGEND
DOUGHERTY PEAK STUDY AREA
Kings Canyon National Park

SYMBOL	MAP UNIT NAME
10	Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.
21	Jointed granitic outcrop - Lithic Cryumbrepts complex, 10 to 25 percent slopes.
22	Jointed granitic outcrop - Lithic Cryumbrepts complex, 15 to 45 percent slopes.
23	Jointed granitic outcrop - Granitic talus - Lithic Cryumbrepts complex, 45 to 130 percent slopes.
24	Jointed granitic outcrop - Lithic Cryumbrepts complex, 45 to 130 percent slopes.
25	Jointed granitic outcrop - Granitic talus - Felsenmeer complex, 45 to 130 percent slopes.
26	Jointed granitic outcrop - Granitic talus - Felsenmeer complex, 15 to 75 percent slopes.
27	Jointed granitic outcrop - Granitic talus - Lithic Xerumbrepts complex, 60 to 130 percent slopes.
28	Jointed granitic outcrop - Lithic Cryumbrepts complex, 15 to 45 percent slopes.
29	Jointed dacitic outcrop - Lithic Xerumbrepts - Typic Xerumbrepts complex, 45 to 130 percent slopes.
40	Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.
50	Lithic Cryumbrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 15 to 35 percent slopes.
51	Lithic Cryumbrepts - Jointed granitic outcrop - Typic Cryorthents complex, 30 to 75 percent slopes.
60	Lithic Xerumbrepts - Lithic Mollic Haploxeralfs - Typic Xerumbrepts complex, 45 to 75 percent slopes.

MAP UNIT LEGEND, Continued

SYMBOL	MAP UNIT NAME
61	Lithic Xerumbrepts - Typic Xerumbrepts - Jointed granitic outcrop complex, 15 to 50 percent slopes.
70	Typic Cryumbrepts - Humic Cryaquepts - Lithic Cryumbrepts complex, 5 to 30 percent slopes.
71	Typic Cryumbrepts - Lithic Cryumbrepts - Jointed granitic outcrop complex, 5 to 45 percent slopes.
80	Granitic talus - Jointed granitic outcrop - Lithic Xerumbrepts complex, 30 to 60 percent slopes.
81	Granitic talus - jointed granitic outcrop complex, 45 to 130 percent slopes.
90	Humic Cryaquepts - Typic Cryofluvents complex, 0 to 15 percent slopes.
100	Entic Xerumbrepts - Jointed granitic outcrop complex, 25 to 65 percent slopes.
110	Lithic Cryumbrepts - Lithic Xerorthents - Jointed granitic outcrop complex, 45 to 75 percent slopes.
W	Lakes and Other Water Bodies

MAP UNITS OF THE DOUGHERTY PEAK STUDY AREA

DESCRIPTIONS OF MAP UNITS

10 Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.

This map unit occurs on unglaciated sideslopes and ridges. Slopes are complex. This unit is composed of two components.

50% Typic Cryorthents, sandy-skeletal, mixed, shallow; 15 to 45 percent slopes
30% Jointed granitic outcrop

The Typic Cryorthents are very shallow and shallow to grus, excessively drained soils that occur on dissected mountain sideslopes and ridges. Typically the soil surface is covered by 80 percent pebbles, mostly pea-size. The jointed granitic outcrop commonly has a very thin mantle of pea-size pebbles on its surface. It occurs mostly on the middle and upper parts of the unit on convex slopes and ridges.

Vegetative cover is scattered lodgepole pines with about 5 to 10 percent canopy cover with very little understory plants and plant litter.

There are two inclusions.

10% Lithic Cryorthents, sandy-skeletal, mixed; 15 to 45 percent slopes
10% Typic Cryumbrepts, loamy-skeletal, mixed; 15 to 35 percent slopes

Lithic Cryorthents occur around the jointed granitic outcrop and are very shallow to granitic bedrock. The Typic Cryumbrepts occur

in the lower, slightly concave mountain sideslopes and glacial basins. They are moderately deep to granitic rock.

21 Jointed granitic outcrop - Lithic Cryumbrepts complex, 10 to 25 percent slopes.

This map unit is on ground till overlying scoured glacial basins. Slopes are complex. The unit is composed of two components.

60% Jointed granitic outcrop.
30% Lithic Cryumbrepts, loamy-skeletal, mixed.

The Lithic Cryumbrepts are shallow, somewhat excessively drained soils that occur on undulating bottoms of scoured glacial basins. It occurs between rock joints and crevices. The surface is covered with 65 percent rock fragments, dominantly small pebbles.

Vegetative cover is lodgepole pine with 10 to 20 percent canopy cover. There are very few understory plants.

There are two inclusions in this map unit.

5% Typic Cryumbrepts, loamy-skeletal, mixed; 5 to 15 percent slopes.
5% Cryofluvents; 0 to 10 percent slopes.

Typic Cryumbrepts are moderately deep to bedrock, somewhat excessively drained soils that occur in lower sideslopes. The Cryofluvents occur around drainageways and seeps. They are deep and are poorly drained.

22 Jointed granitic outcrop - Lithic Cryumbrepts complex, 15 to 45 percent slopes.

This map unit occurs on glacial basins and cirques. Slopes are complex. The unit is composed of two components.

60% Jointed granitic outcrop.
30% Lithic cryumbrepts, loamy-skeletal, mixed; 15 to 45 percent slopes.

The Lithic Cryumbrepts are shallow, somewhat excessively drained soils that occur between rock joints and crevices on lower sideslopes of glacial basins and cirques. The soil surface is covered by about 80 percent rock fragments, dominantly pea-size pebbles.

Vegetative cover is dominantly lodgepole pine with smaller amounts of whitebark and white pines. The canopy cover is 5 to 15 percent. The small amount of understory plant existing are chinquapin, willow and sedges.

There is one inclusion in this map unit.

10% Typic Cryumbrepts, loamy-skeletal, mixed; 15 to 45 percent slopes.

These soils are moderately deep and occur in slightly concave lower sideslopes.

23 Jointed granitic outcrop - Granitic talus - Lithic Cryumbrepts complex, 45 to 130 percent slopes.

This soil map unit occurs on cirque basins. Slopes are complex. The unit is composed of three components.

60% Jointed granitic outcrop
20% Granitic talus
15% Lithic Cryumbrepts, loamy-skeletal, mixed, 45 to 75 percent slopes.

The Lithic Cryumbrepts are shallow, well drained soils that occur on sideslopes of cirque basins between rock joints and crevices. Vegetative cover is widely scattered whitebark and white pines with less than one percent understory plants.

There are two inclusions in this map unit.

4% Typic Cryumbrepts, loamy-skeletal, mixed; 15 to 45 percent slopes.
1% Cryofluvents; 0 to 10 percent slopes.

24 Jointed granitic outcrop - Lithic Cryumbrepts complex, 45 to 130 percent slopes.

This map unit is on sideslopes of cirque basins. Slopes are complex. The unit is composed of two components.

75% Jointed granitic outcrop.
20% Lithic Cryumbrepts, loamy-skeletal, mixed; 45 to 75 percent slopes.

The Lithic Cryumbrepts are shallow, somewhat excessively drained soils that occur on sideslopes of cirque basins between rock joints and crevices.

Vegetative cover is scattered whitebark and white pines with less than 5 percent canopy cover. A few shrubs include mount mahogany, currant and willows.

There are two inclusions in this map unit.

3% Granitic talus.

2% Felsenmeer.

25 Jointed granitic outcrop - Granitic talus - Felsenmeer complex, 45 to 130 percent slopes.

This map unit is on cirque headwalls and talus cones above treeline. Slopes are complex. The unit is composed of three components.

55% Jointed granitic outcrop

20% Granitic talus

15% Felsenmeer

There are three inclusions in this map unit.

6% Typic Cryorthents, sandy-skeletal, mixed

3% Lithic Cryumbrepts

1% Cryaquepts

The Typic Cryorthents are moderately deep and deep, excessively drained soils that occur within the granitic talus. The Lithic Cryumbrepts are shallow and very shallow, excessively drained soils that occur around rock outcrop. The Cryaquepts are poorly drained soils around seeps and drainages.

26 Jointed granitic outcrop - Granitic talus - Felsenmeer complex, 15 to 75 percent slopes.

This map unit occurs on high cirque basins, unglaciated divides and glacial terraces above treeline. Slopes are complex. The unit is composed of three components.

55% Jointed granitic outcrop
20% Granitic talus
15% Felsenmeer

Glacial debris in the form of stones and boulders cover about a third of the jointed granitic outcrop surface.

There are two inclusions in this map unit.

5% Typic Cryorthents, sandy-skeletal, mixed
5% Lithic Cryumbrepts

The Typic Cryorthents occur in between the stones and boulders in the talus. The Lithic Cryumbrepts occur between the rock joints and crevices and on ledges.

27 Jointed granitic outcrop - Granitic talus - Lithic Xerumbrepts complex, 60 to 130 percent slopes.

This map unit occurs on glacial basins sidewalls and river canyon walls. Slopes are complex. The unit is composed of three components.

55% Jointed granitic outcrop
20% Granitic talus
15% Lithic Xerumbrepts, loamy-skeletal, mixed, mesic, 60 to 75 percent slopes

The Lithic Xerumbrepts are very shallow and shallow, somewhat excessively drained soils that occur in between rock joints and crevices and on rock ledges.

Vegetative cover is scattered Jeffrey pine, incense cedar and black oak with a canopy cover of less than 10 percent. Also there is about 5 percent low sagebrush and 10 percent manzanita coverage.

There are two inclusions in this map unit.

5% Lithic Xerumbrepts, loamy-skeletal, mixed, frigid
5% Typic Xerumbrepts, loamy-skeletal, mixed, frigid

The Lithic Xerumbrepts are very shallow and shallow, somewhat excessively drained soils that occur in the rock outcrop in the higher elevations. The Typic Xerumbrepts are moderately deep and deep, somewhat excessively drained soils that occur commonly on slightly concave sideslopes.

28 Jointed granitic outcrop - Lithic Cryumbrepts complex, 15 to 45 percent slopes.

This map unit occurs on glacial basins sideslopes. Slopes are complex. There are two components in this map unit.

60% Jointed granitic outcrop
30% Lithic cryumbrepts, loamy-skeletal, mixed; 15 to 45 percent slopes

This map unit is composed of bench-like patterns of rectangular blocks of jointed granitic outcrop orientated in a northeast direction. A block of rock alternates with soil in a series of steps. The Lithic Cryumbrepts are very shallow and shallow, somewhat excessively drained soils that occur between rock joints, crevices and on rock ledges.

Vegetative cover is mostly lodgepole pine, white pine and whitebark pine.

There are three inclusions in this map unit.

4% Lithic Cryorthents, sandy-skeletal, mixed
4% Typic Cryumbrepts, loamy-skeletal, mixed

2% Cryaquepts

The Lithic Cryorthents occur in the upper part of the unit. The Typic Cryumbrepts are moderately deep, somewhat excessively drained soils that occur on the lower and slightly concave sideslopes. The Cryaquepts are poorly drained soils around seeps and drainages.

29 Jointed dacitic outcrop - Lithic Xerumbrepts - Typic Xerumbrepts complex, 45 to 130 percent slopes.

This map unit occurs on canyon walls. Slopes are complex. The unit is composed of three components.

50% Jointed dacitic outcrop
35% Lithic Xerumbrepts, loamy-skeletal, mixed, mesic; 45 to 75 percent slopes
15% Entic Xerumbrepts, loamy-skeletal, mixed, mesic; 45 to 75 percent slopes

The Lithic Xerumbrepts are very shallow and shallow, somewhat excessively drained soils that occur on sideslopes of canyon walls in between rock joints, crevices and on rock ledges. The Entic Xerumbrepts are moderately deep and deep, somewhat excessively drained soils that occur on slightly concave lower sideslopes of canyons.

There are three inclusions in this map unit.

5% Lithic Xerumbrepts, loamy-skeletal, mixed, frigid; 45 to 75 percent slopes
5% Typic Xerumbrepts, loamy-skeletal, mixed, frigid; 45 to 75 percent Slopes
5% Dacitic talus

Both of these soils are similar to the mesic component soils. They have slightly cooler temperatures however.

40 Typic Cryorthents - Jointed granitic outcrop complex, 15 to 45 percent slopes.

This map unit is on scoured glacial basins. Slopes are complex. The unit is composed of three components.

45% Typic Cryorthents, sandy-skeletal, mixed; 15 to 45 percent slopes
25% Jointed granitic outcrop
20% Typic Cryorthents, sandy-skeletal, mixed, shallow; 15 to 45 percent slopes

The first component are moderately deep to granitic rock, excessively drained soils that occur in depressions. The third component are very shallow and shallow to granitic grus, excessively drained soils that occur in between rock joints and crevices and on rock ledges.

Vegetative cover is lodgepole pine with some whitebark pine and white pine. Canopy cover is 10 to 20 percent. Very few plants are in the understory.

There are two inclusions in this map unit.

5% Felsenmeer
5% Granitic talus

50 Lithic Cryumbrepts - Jointed granitic outcrop - Typic Cryumbrepts complex, 15 to 35 percent slopes.

This map unit is on glacial basin floors and lower sideslopes. Slopes are complex. The unit is composed of three components.

45% Lithic Cryumbrepts, loamy-skeletal, mixed; 15 to 35 percent slopes

35% Jointed granitic outcrop

15% Typic Cryumbrepts, loamy-skeletal, mixed; 15 to 35 percent slopes

The Lithic Cryumbrepts are very shallow and shallow, somewhat excessively drained soils that occur between rock joints and crevices and on rock ledges. The Typic Cryumbrepts are moderately deep, well drained soils that occur in depressions on glacial basin floors.

Vegetative cover is lodgepole, whitebark and foxtail pines. The canopy cover is 10 to 20 percent. The understory amounts to 10 to 20 percent.

There is one inclusion in this map unit.

5% Humic Cryaquepts, sandy-skeletal, mixed; 5 to 15 percent slopes

The Humic Cryaquepts are very poorly and poorly drained soils that support meadow vegetation.

51 Lithic Cryumbrepts - Jointed granitic outcrop - Typic Cryorthents complex, 30 to 75 percent slopes.

This map unit is on glaciated and unglaciated cirque walls, mountain ridges and sideslopes. Slopes are complex. The unit is composed of three components.

35% Lithic Cryumbrepts, loamy-skeletal, mixed; 45 to 75 percent slopes

30% Jointed granitic outcrop

20% Typic Cryorthents, sandy-skeletal, mixed; 30 to 45 percent slopes

The Lithic Cryumbrepts are very shallow and shallow, somewhat excessively drained soils that occur on ridges and on the upper mountain sideslopes. The Typic Cryorthents are mostly moderately deep, excessively drained soils that occur on the lower mountain sideslopes associated with talus.

Vegetative cover is whitebark pine and white pine in the higher and cooler sites and lodgepole pine in the lower and warmer sites. There is very little understory plants.

There are two inclusions in this map unit.

12% Granitic talus
3% Felsenmeer

60 Lithic Xerumbrepts - Lithic Mollic Haploxeralfs - Typic Xerumbrepts complex, 45 to 75 percent slopes.

This map unit is on canyon sideslopes. Slopes are complex and are unstable with many loose rock fragments on the surface. The unit is composed of three components.

30% Lithic Xerumbrepts, loamy-skeletal, mixed, frigid; 45 to 75 percent slopes
25% Lithic Mollic Haploxeralfs, loamy-skeletal, mixed, frigid; 45 to 75 percent slopes
25% Typic Xerumbrepts, loamy-skeletal, mixed, frigid; 45 to 75 percent slopes

The Lithic Xerumbrepts are mostly shallow, somewhat excessively drained soils that occur on rocky crests and ridges. The Lithic Mollic Haploxeralfs are mostly shallow, somewhat excessively

drained soils that occur on canyon sideslopes around rock outcrops. The Typic Xerumbrepts are moderately deep, somewhat excessively drained soils that occur on smooth to slightly convex canyon sideslopes.

Vegetative cover is mostly manzanita, canyon liveoak and ceanothus on the first component. The second component has low sagebrush, phlox and Idaho fescue on it. The third has mostly manzanita and ceanothus with a few scattered Jeffrey and sugar pines and western juniper. This area has been subjected to a repeated number of burnings.

There are two inclusions in this map unit.

14% Jointed granitic outcrop
6% Entic Cryumbrepts; 30 to 60 percent slopes

The Entic Cryumbrepts are on north and east aspects often in slightly concave pockets. The vegetation includes willows, snowberry and western white fir.

61 Lithic Xerumbrepts - Typic Xerumbrepts - Jointed granitic outcrop complex, 15 to 50 percent slopes.

This map unit is on canyon and glacial basins sideslopes. Slopes are complex. The unit is composed of three components.

40% Lithic Xerumbrepts, loamy-skeletal, mixed, frigid; 15 to 50 percent slopes
35% Typic Xerumbrepts, loamy-skeletal, mixed, frigid; 15 to 50 percent slopes
20% Jointed granitic outcrop

The Lithic Xerumbrepts are shallow, somewhat excessively drained soils that occur in between rock joints and crevices around rock

outcrops. The Typic Xerumbrepts are moderately deep and deep, somewhat excessively drained soils that occur on canyon sideslopes.

Vegetative cover is mainly manzanita, ceanothus and low sagebrush on the Lithic Xerumbrepts. Jeffrey pine with some white fir with an understory of similar shrubs occurs on the Typic Xerumbrepts.

There are two inclusions in this map unit.

- 7% Entic Xerumbrepts, sandy-skeletal, mixed, frigid; 30 to 60 percent slopes
- 3% Aquents

The Entic Xerumbrepts are moderately deep and deep, excessively drained soils that occur in sheltered, commonly north and east facing lower sideslopes. They support red fir. The Aquents are poorly drained soils that occur around seeps and drainages.

70 Typic Cryumbrepts - Humic Cryaquepts - Lithic Cryumbrepts complex 5 to 30 percent slopes.

This map unit is on undulating glacial basin floors. Slopes are complex. The unit is composed of three components.

- 35% Typic Cryumbrepts, loamy-skeletal, mixed; 5 to 15 percent slopes
- 25% Humic Cryaquepts, sandy-skeletal, mixed; 5 to 15 percent slopes
- 25% Lithic Cryumbrepts, loamy-skeletal, mixed; 15 to 30 percent slopes

The Typic Cryumbrepts are moderately deep, well drained soils that occur on gently rolling glacial basin floors. The Humic Cryaquepts are deep, very poorly and poorly drained soils that occur around seeps and drainageways. The Lithic Cryumbrepts are shallow,

somewhat excessively drained soils that occur on short sideslopes. It has about 60 percent rock fragments on the surface of which 15 to 40 percent are stones and boulders.

Vegetative cover is mainly lodgepole pine and lesser amounts of white pine on the first and third components. Subalpine vegetation including willow, sedges, mountain heather and some lodgepole pine occur on the second component.

There are two inclusions in this map unit.

13% Jointed granitic outcrop
2% Rubbleland (glacial)

71 Typic Cryumbrepts - Lithic Cryumbrepts - Jointed granitic outcrop complex, 5 to 45 percent slopes.

This map unit is on glacial basins and lower mountain sideslopes. Slopes are complex. The unit is composed of three components.

45% Typic Cryumbrepts, loamy-skeletal, mixed; 5 to 15 percent slopes
30% Lithic Cryumbrepts, loamy-skeletal, mixed; 15 to 45 percent slopes
15% Jointed granitic outcrop

The Typic Cryumbrepts are moderately deep to granitic rock, well drained soils that occur on the glacial basin floors. The Lithic Cryumbrepts are very shallow and shallow, somewhat excessively drained soils that occur on mountain sideslopes associated with rock outcrop.

Vegetative cover is mainly lodgepole pine with lesser amounts of western white pine and whitebark pine. There are very few understory associates.

There are two inclusions in this map unit.

5% Cryaquepts
5% Rubbleland (glacial)

The Cryaquepts are very poorly and poorly drained soils that support meadow vegetation.

80 Granitic talus - Jointed granitic outcrop - Lithic Xerumbrepts complex, 30 to 60 percent slopes.

This map unit is on canyon sideslopes and alluvial fans. Slopes are complex. The unit is composed of three components.

55% Granitic talus
20% Jointed granitic outcrop
15% Lithic Xerumbrepts, loamy-skeletal, mixed, frigid; 30 to 60 percent slopes

The Lithic Xerumbrepts are very shallow and shallow soils to granitic rock, somewhat excessively drained soils that occur on glacial basins, rocky crests, and ridges of canyons.

Vegetative cover is mainly shrubs such as ceanothus, manzanita, willow, choke cherry, and canyon liveoak. Trees cover less than 5 percent of the unit.

There is one inclusion in this map unit.

10% Entic Xerumbrepts, loamy-skeletal, mixed, mesic

The inclusion are moderately deep and deep, somewhat excessively drained soils that occur on the lower sideslopes.

81 Granitic talus - Jointed granitic outcrop complex, 45 to 130 percent slopes.

This map unit is on cirque head walls, avalanche chutes and ridges. Slopes are complex. The unit is composed of two components.

45% Granitic talus
40% Jointed granitic outcrop

There is three inclusions in this map unit.

7% Cryaquepts, 15 to 75 percent slopes
5% Lithic Cryumbrepts, loamy-skeletal, mixed; 50 to 75 percent slopes
3% Typic Cryorthents, sandy-skeletal, mixed; 50 to 75 percent slopes

The Cryaquepts are very poorly drained and are covered by sedges, grasses, and some willows. The Lithic Cryumbrepts are very shallow and shallow to granitic rock, well drained soils. The Typic Cryorthents are moderately deep and deep, excessively drained soils that occur between the talus.

90 Humic Cryaquepts - Typic Cryofluvents complex, 0 to 15 percent slopes.

This map unit is on drainageways and stream outwash deposits and around seeps. The unit is composed of three components.

40% Humic Cryaquepts, sandy-skeletal, mixed; 0 to 5 percent slopes
25% Typic Cryofluvents, sandy, mixed; 0 to 10 percent slopes
20% Humic Cryaquepts, sandy-skeletal, mixed; 5 to 15 percent slopes

The first component are deep, very poorly drained soils that occur in drainageways. The second component are deep, moderately well drained soils that occur on the stream outwash deposits. The third component are deep, somewhat poorly and poorly drained soils that occur in drainageways and around seeps.

Vegetative cover is wet and dry meadow vegetation such as sedges, cinquefoil, buttercup, currant and willows on the first and third component soils. The second component has large lodgepole pines with very little understory.

There are three inclusions in this map unit.

8% Lithic Cryumbrepts, loamy-skeletal, mixed; 5 to 20 percent slopes

6% Typic Cryumbrepts, loamy-skeletal, mixed; 5 to 20 percent slopes

1% Surface water

100 Entic Xerumbrepts - Jointed granitic outcrop complex, 25 to 65 percent slopes.

This map unit is on canyon sideslopes. Slopes are complex. The unit is composed of two components.

50% Entic Xerumbrepts, loamy-skeletal, mixed, mesic; 25 to 45 percent slopes

30% Jointed granitic outcrop

The Entic Xerumbrepts are moderately deep, somewhat excessively drained soils that occur on the lower and warmer canyon sideslopes.

Vegetative cover is Jeffrey pine, black oak, incense cedar and canyon live oak.

There are three inclusions in this map unit.

10% Entic Xerumbrepts, sandy-skeletal, mixed, frigid; 45 to 65 percent slopes
7% Lithic Xerumbrepts, loamy-skeletal, mixed, mesic
3% Granitic talus

The Entic Xerumbrepts are moderately deep and deep, somewhat excessively drained soils that occur on the upper and cooler sideslopes. The vegetation is mainly red fir with some sugar pine and Jeffrey pine. The Lithic Xerumbrepts are very shallow and shallow, somewhat excessively drained soils that occur around jointed granitic outcrop.

110 Lithic Cryumbrepts - Lithic Xerorthents - Jointed granitic outcrop complex, 45 to 75 percent slopes.

This map unit is on unglaciated canyon sideslopes. Slopes are complex. The unit is composed of three components.

35% Lithic Cryumbrepts, sandy-skeletal, mixed; 45 to 75 percent slopes
35% Lithic Xerorthents, sandy-skeletal, mixed, frigid; 45 to 75 percent slopes
20% Jointed granitic outcrop

The Lithic Cryumbrepts are very shallow and shallow to granitic rock, excessively drained soils that commonly occur on the north and east aspects. The Lithic Xerorthents are very shallow and shallow to granitic rock, excessively drained soils that commonly occur on the west and south aspects.

Vegetative cover is red fir, western white pine and lodgepole pine with 20 to 40 percent canopy cover on the Lithic Cryumbrepts.

Jeffrey pine, sugar pine and a small amount of red fir cover the Lithic Xerorthents. Cover is about 5 to 15 percent.
There is one inclusion in this map unit.

5% Entic Xerumbrepts, sandy-skeletal, mixed; 45 to 75 percent slopes

This inclusion are moderately deep and deep, somewhat excessively drained soils that are on the lower northerly aspects.

W Lakes and Other Water Bodies.