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SOILS of the San Dimas Experimental Forest

James M. Crawford, Jr.

PACIFIC SOUTHWEST
FOREST AND RANGE
EXPERIMENT STATION
BERKELEY, CALIFORNIA

FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

ACKNOWLEDGMENT

The San Dimas Experimental Forest is maintained by the Forest Service, U.S. Department of Agriculture, in cooperation with the California Division of Forestry. Since 1947 this area has been a joint research project with the California Division of Forestry, which participates in program planning and provides financial support. Other long-term cooperators are the Los Angeles County Flood Control District, the Los Angeles County Fire Department, and the University of California, which provides staff or other support, or use research facilities at the experimental forest.

Special recognition is due these agencies and the California Department of Water Resources for assistance with emergency rehabilitation work after a wildfire in July 1960. Their cooperation made it possible to restore experimental facilities and start emergency research on methods of managing chaparral watersheds for more effective control of fires, floods and erosion, and water yield. A part of this research program was an intensive soils survey of the San Dimas Experimental Forest.

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SOILS OF THE SAN DIMAS EXPERIMENTAL FOREST

By

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Research Forester

The soils of the San Dimas Experimental Forest were mapped in September and October after a wildfire on July 20, 1960, burned 15,000 acres of the 17,000-acre forest. This experimental area lies on the foothills of the San Gabriel Mountains about 30 miles northeast of Los Angeles. Elevation ranges from 1,300 feet in Big Dalton Canyon in the southwest to almost 5,600 feet in the northeast. The San Dimas Experimental Forest has a Mediterranean climate: cool winters when most of the annual rainfall occurs and hot, dry summers. Snow sometimes falls at high elevations, but is infrequent and melts rapidly. Average precipitation at the Tanbark Flat headquarters (2,700 feet) is 27 inches. Average temperature at Tanbark for the coldest month (January) is 46.6°F. The minimum temperature recorded there was 18°F.; the maximum was 108.5°F.; and the annual mean temperature, 57.7°F.

Rocks within the experimental forest belong to an igneous-metamorphic complex. In most of the area, they occur as small intrusions and inclusions which are intricately associated with other small bodies. Most rocks date to pre-Cambrian or Paleozoic eras. Diorites, schists, gneisses, granites, and granodiorites are the most common. Dikes are also common and generally composed of pegmatite, aplite, silexite, dacite, and lamprophyre. Immediately south of Johnstone Peak and west of San Dimas Dam lie two volcanic areas of andesite and basalt.

Only the southernmost part of the experimental forest has relatively gentle slopes; most of the area has very steep slopes. The minutely dissected area around Tanbark Flat is generally of the same geological composition as the rest of the forest, but it shows a different aspect from the deep, wide canyons common to the west and the south. Bean (1944)[1/] contends that the Tanbark area developed during a period of diastrophic quiet after the San Gabriels had already been elevated considerably. After this quiet period, further uplift rejuvenated the mountain range. The streams began to cut anew, working headward from the edge of the mountains. This down-cutting is still active.

1/ Bean, Robert T. Geology of watersheds, V, VII, and Lower VI, San Dimas Experimental Forest, Progress Report. p. 3, 1944. (Unpublished report on file Pacific SW. Forest & Range Expt. Sta., U.S. Forest Serv., Berkeley, Calif.)

Shrubs dominate the forest vegetation. Tree forms can develop along stream channels and at the higher elevations in the eastern part on northerly slopes. Hardwoods predominate, although one conifer, Pseudotsuga macrocarpa, is fairly common, especially on steep colluvial slopes. Pinus ponderosa grows at Browns Flat. Hardwoods line the bottoms of most larger canyons.

Common hardwood species include:

Alnus rhombifolia
Platanus occidentalis
Quercus chrysolepis
Quercus agrifolia
Umbellularia californica

Common shrubs include:

Adenostoma fasciculatum
Arctostaphylos glauca
Ceanothus leucodermis
Cercocarpus betuloides
Eriodictyon trichocalyx
Garrya fremontii
Haplopappus squarrosus
Lonicera subspicata
Nicotiana glauca
Photinia arbutifolia
Prunus illicifolia
Quercus dumosa
Quercus wislizenii
Rhus diversiloba
Rhus laurina
Rhus ovata
Salvia mellifera
Yucca whipplei

MAPPING PROCEDURES

Areas were delineated on aerial photographs according to slope classes to a minimum of 2-1/2 acres. The scale of the aerial photographs was about 1:10,000.

Percent slope	Slope class
0-39	1
40-54	2
55-69	3
70-	4

Within each class soils were mapped as to series and vertical depth. Seven tentative soil series were mapped, and each series is described in this report. Soil depths fell into one of five classes:

Soil depths, inches	Depth class
0-11	1
12-23	2
24-35	3
36-47	4
48-	5

The depth class shown in a symbol means the average depth within an area. Depths are extremely variable within short distances, but soil depth is

generally correlated to slope and aspect. As a rule, the steeper the slope, the shallower the soil. North-facing slopes generally have deeper soils than south-facing slopes. Soils derived from gneiss are deeper than those found on diorites and schists.

Slope class 4 soils on parent material other than gneiss are generally less than 12 inches deep, slope class 3 soils usually are less than 24 inches deep, and depths of soils on slope classes 1 and 2 usually exceed 24 inches.

Four rockiness classes were established:

Rockiness	Rockiness class
Less than 10 percent surface rocks greater than 3 inches in diameter (excluding large rock outcrops, which have their own symbol).	No symbol
Greater than 10 percent surface rocks greater than 3 inches in diameter, but less than 10 percent surface rocks greater than 24 inches in diameter.	R1
10 to 50 percent surface rocks greater than 24 inches in diameter.	R2
Greater than 50 percent surface rocks greater than 3 inches in diameter	R3

Numerous rock outcrops occur in R1 areas. These scattered outcrops have been ignored in determining the rockiness classification for a particular area. Rock outcrops of less than 2-1/2 acres have been given the symbol "V". Most of the forest has R1 rockiness classification; a significant part has less than 10 percent rockiness. Soils developed from pure gneiss have no surface rockiness. An extensive area of rock-free soil is found northwest of the upper East Fork of San Dimas Canyon. The total acreage in the R2 and R3 classes is small.

SOIL SYMBOLS

The soils were mapped according to standard soil series criteria. Each series has been tentatively designated by a capital letter. Depth class, slope class, and amount of surface rockiness are also included in each description, which is represented by a fractional symbol. An example of a typical symbol is:

$$\frac{\text{Ac}}{\text{2R1-4}}$$

In the above example the soil series is "A." The small "c" shows that the soil is colluvial; a small "a" indicates an alluvial soil. The number "2" means that the average depth of the soil is from 12 to 28 inches. R1 indicates that the soil has more than 10 percent of surface rocks over 3 inches in diameter, but less than 10 percent rocks over 24 inches in diameter. The number "4" shows that the average slope within the type is greater than 70 percent.

SOIL SERIES

"A" SERIES[2/]

Excessively-drained, shallow, and coarse-textured, the "A" soils are derived from diorites, granodiorites, schists, and gneiss. These soils are typical of the entire San Dimas area up to about 4,500 feet elevation. Above 4,500 feet they are replaced by the "G" soils. The "A" soils are common on steep slopes, especially those over 40 percent. On ridges, benches, and areas of gentle slope the "A" soils are replaced by the "B" or "C" soils.

The "A" soils range from neutral at the surface to slightly acid at about 2 feet below. These soils are usually gravelly and stony throughout the profile. The boundary between the soil and the underlying decomposed parent material is very gradual; the soil is often undistinguishable from the parent material.

These soils have weak, angular, blocky structure. Their consistency is loose when dry, and loose to very friable when moist. Depths are mostly less than 24 inches, measured vertically.

Soil profile.--

1.	0-5 inches	Pale brown (10YR6/3 dry, 10YR4/3 moist) gravelly, sandy loam; weak to moderate, medium, angular, blocky structure; soft when dry to very friable when moist; very slightly acid to neutral; 1 to 6 inches thick; gradual, wavy lower boundary.
2.	6-11 inches	Pale brown (10YR6/3 dry, 10YR4/3 moist) gravelly, loamy sand; weak to moderate, fine, angular, blocky structure; loose when dry to very friable when moist; very slightly acid; 5 to 10 inches thick; gradual, irregular lower boundary.

2/ These soils are classified according to accepted soil series standards. No attempt will be made to correlate these soils as part of the National System for the time being.

3.	12-16 inches	Light yellowish brown (10YR6/4 dry, 10YR4/3 moist) sandy gravel; weak, fine, angular, blocky to single-grain structure; loose when dry to loose when moist; slightly acid; 5-10 inches thick; diffuse lower boundary.
4.	17- inches	Heavily weathered igneous and metamorphic rocks, mostly gneiss, schists, diorites, and granodiorites; variations of rock type occurring within short distances, sometimes within a few feet.

Range in characteristics.--The surface color (dry) ranges from pale brown to brown. The subsoil color (dry) ranges from light yellowish brown to yellowish brown. Subsoil texture ranges from a gravelly, sandy loam to a gravelly sand. The soils are typically gravelly, and become increasingly rocky with depth. Typically more than 10 percent of the surface is covered by rocks over 3 inches in diameter. Soil depth is variable within short distances. Shallow and very shallow depth phases predominate. Distinct soil horizons may often be lacking.

Topography.--Slopes vary from steep to extremely steep. Very steep slopes are by far the most common. The "A" soils generally occur below 4,500 feet elevation.

Drainage and permeability.--The soils are excessively drained. The underlying decomposed rock can absorb large amounts of water.

Vegetation.--Chaparral. Rhus ovata, Quercus dumosa, Quercus wislizenii, Adenostoma fasciculatum, Yucca whipplei Eriogonum sp., Salvia mellifera, Eriodictyon trichocalyx, and Photinia arbutifolia are the most common shrubs.

Use.--Watershed protection; browse and cover for wildlife.

Distribution.--San Gabriel Mountains of southern California.

Type location.--Sec. 3, T1N, R9W. San Bernardino Meridian. Head of Monroe Canyon, 350 feet below ridge near trail.

Remarks.--This soil is probably common throughout mountainous areas of southern California with similar vegetation and geology.

"B" SERIES[3/]

The "B" soils are well-drained, moderately coarse-textured, fairly deep soils occurring usually on gneiss. They commonly occur on relatively gentle, north-facing slopes. In areas where gneiss is extensive, "B" soil occurs on all aspects, although it is shallower on south-facing, extremely steep slopes. "B" soil is similar to "A", but is deeper, shows more development, has better and stronger structure, and is less rocky. "A" occurs on steeper slopes and usually on parent materials having a higher percentage of quartz. In some areas of "B", soil development approaches a clay loam. Here the soils somewhat resemble "C" soils, but "C" contains a larger amount of small quartz grains and is typically redder than "B".

The "B" soils range from very slightly acid at the surface to slightly acid at the top of the decomposed underlying rock. Very little surface rockiness and very little stoniness within the profile are found in this series. Some areas of pure gneiss are entirely rock-free.

Often we found it extremely difficult to determine the depth of this soil because the decomposed parent material below is heavily weathered 10 to 15 feet deep or more. The "horizon" at these depths often resembles horizons near the surface, the only apparent difference often being the degree of cementation and aggregation of the minerals composing the rock. The material near the surface is loose or only slightly aggregated, whereas several feet deeper, the material is more firmly cemented. Slight pressure however, will reduce this decomposed rock to its mineral fragments. This deeper material to all appearances is almost identical to that nearer the surface. Vegetation appears to grow equally well in areas where the more firmly cemented material outcrops at the surface and in areas of loose soil material.

"B" soil has a moderate to strong, fine to medium, angular, blocky structure. Its consistency is slightly hard when dry to very friable when moist. Depths usually exceed 3 feet, measured vertically.

This soil is well drained and has a high water holding capacity. Erosion is not a serious problem.

Soil profile.--

1. 0-4 inches — Light yellowish brown (10YR6/4 dry, 10YR3/3 moist) silty, sandy loam; moderate to strong, medium, angular, blocky structure; slightly hard when dry to very friable when moist; very slightly acid; 2 to 6 inches thick; gradual, wavy lower boundary.

3/ Tentative series, not correlated.

2. 5-28 inches — Very pale brown or yellow to yellowish brown (10YR7/5 dry, 10YR5/6 moist) silty, sandy, loam; moderate to strong, fine, angular, blocky structure; slightly hard when dry to very friable when moist; slightly acid; 6 inches to 4 or 5 feet thick; diffuse lower boundary.

3. 29- inches — Heavily weathered gneiss, sometimes with an admixture of diorites and schists.

Range in characteristics.--The surface color (dry) ranges from light yellowish brown to brown, and the subsoil color (dry) from yellowish brown and very pale brown to a somewhat reddish brown. The subsoil texture is usually a sandy loam or a silty, sandy loam, sometimes approaching a clay loam. The "B" soils are typically non-rocky, non-stony deep soils. In many areas dikes, often quartzitic, permeate the gneiss. Soils with more than 10 percent surface rockiness (rocks more than 3 inches in diameter) can often be found there. Soil depth is quite variable over short distances, and ranges from 3 to 5 feet and more.

Topography.--Slope varies from non-steep to extremely steep, but is typically steep (30-50 percent). The "B" soils are usually found below 4,500 feet elevation.

Drainage and permeability.--The soils are well-drained, and erosion is less severe than on the "A" soils. Water holding capacity of the "B" soils is greater than that of "A".

Vegetation.--Chaparral. Quercus dumosa, Adenostoma fasciculatum, Arctostaphylos glauca, Salvia mellifera, Rhus ovata, and Yucca whipplei are the most common shrubs.

Use.--Watershed protection; browse and cover for wildlife.

Distribution.--San Gabriel Mountains of southern California.

Type location.--Sec. 1, T1N, R9W, San Bernardino Meridian, 100 feet west of Little Bell Dams road, 600 feet west of junction with Dalton Road.

Remarks.--This soil may be expected throughout southern California mountain areas under conditions similar to the type location.

"C" SERIES[4/]

The "C" soils are moderately fine-textured and well-drained. They developed mainly from granodiorites and quartz diorites and have many quartz grains. They occur most commonly on narrow ridges, but have also been found at lower elevations on northerly, gentle to steep slopes. The occurrence of "C" soil is probably determined by a combination of minerals of high iron content and quartz in the parent material. Also, a certain amount of soil stability is needed to permit clay development. Soil stability and moisture retention perhaps explain why there is a tendency toward finer textured soils on the narrow ridges although these soils may be extremely shallow. A coating of reddish colloidal clay may be deposited as a thin film within the cracks and crevices of the decomposed rock. A first glance, this material looks like gravel and cobbles of pure clay, but closer examination reveals the fine deposit of clay on the surface of the decomposed rock. Occasionally the rock seems to be saturated with the clay. Some areas show good development of clay in the soil as well as the clay film deposits. The occurrence of "C" soil is erratic, and seldom in areas of mappable size. Many broad flat ridges have "A" or "B" soils, where one might expect the "C" soils to have developed.

The "C" soils range from neutral at the surface to medium and strongly acid in the subsoil. On many of the shallower ridges the subsoil is slightly acid. The soils may be stony or non-stony. Their structure is strong, fine, angular, and blocky. Their consistency is slightly hard when dry near the surface and very hard when dry in the subsoil. When moist, the soil is friable throughout the profile. Depths are usually greater than 24 inches, measured vertically, but may be only a few inches on narrow ridges.

In its less reddish phases "C" soil closely resembles the Auberry series of the Sierra foothills.

Soil profile.--

1. 0-6 inches — Light brown (7.5YR6/4 dry, 7.5YR5/6 moist) sandy loam; strong, fine, angular, blocky structure; slightly hard when dry to friable when moist; very slightly acid to neutral; 2 to 6 inches thick; clear, abrupt lower boundary.

2. 7-20 inches — Light brown (7.5YR6/4 dry, 7.5YR4/4 moist) sandy clay loam; strong, medium, angular, blocky structure; hard when dry to friable when moist; slightly acid to very slightly acid; 6 to 20 inches thick; gradual, irregular lower boundary.

4/ Tentative series, not correlated.

3. 21-48 inches Reddish yellow to light brown (7.5YR7/6 to 7.5YR6/4 dry, 7/5YR4/4 moist) gravelly, sandy clay loam; strong, medium, angular, blocky structure; very hard when dry to friable when moist; strongly acid to medium acid; 6 to 24 inches thick; diffuse lower boundary.

4. 49- inches Decomposed quartz-diorite, becoming less weathered and more solid with depth.

Range in characteristics.--The color varies widely, ranging from reddish and reddish yellow to light brown, and may occasionally be mottled. Partially weathered feldspars sometimes give the subsoil a whitish, mottled appearance. Typically a clay loam; subsoil texture may or may not be stony. Subsoils are usually considerably more acid than the surface horizon. Depths range from a few inches to 4 feet.

Topography.--Slopes are usually flat to gentle. "C" soil is seldom found on very steep slopes. It generally occurs below 4,000 feet.

Drainage and permeability.--The soils are well-drained, yet have a high waterholding capacity because of the clay development within the subsoil.

Vegetation.--Chaparral. Photinia arbutifolia, Cercocarpus betuloides, Quercus dumosa, Quercus wislizenii, Garrya fremontii, Haplopappus sp., Solanum sp., Lonicera sp., Rhus laurina, and Rhus ovata are some of the most common shrubs.

Use.--Watershed protection; browse and cover for wildlife.

Distribution.--Lower elevations and foothills of the San Gabriel Mountains of southern California.

Type location.--Sec. 19, T1N, R8W, San Bernardino Meridian, 1/4 mile west of watertank along Sunset Truck Trail.

Remarks.--The apparently limited occurrence of "C" soil will probably prevent its serious consideration in future land management planning. Its occurrence on ridges indicates the soil type that could possibly develop elsewhere if the slopes were gentler and water or gravity did not remove the soil almost as fast as it is formed. The deeper phases of "C" are among the better soils of the San Dimas area.

"D" SERIES[5/]

The "D" soils are moderately well developed, fine-textured, somewhat poorly drained soils developed on calcareous tufa. They are commonly associated with springs. Whether calcareous tufa develops around all springs is unknown. Bean, in reporting on the geology of the Big Dalton and Little Dalton watersheds, wrote: "Recent deposits of calcareous tufa, some of which might be mistaken for bed-rock, occur in the canyons in many places. These cover the rocks at many waterfalls and at certain springs. In many places the gravel in stream bottoms, which are largely dry in the summer, is cemented into a kind of conglomerate by tufa. This 'conglomerate' ordinarily remains where formed in the stream-bed, but in a few places, pieces of it have been broken off and have been carried away as part of the stream gravel."[6/]

In the soil survey of the San Dimas Experimental Forest, we found only one area with soils developed from this calcareous tufa. Near the head of Volfe Canyon, "D" soil occurs spottily with the common "A" soil. Nothing in the character of the topography nor in the vegetation appears to indicate the underlying calcareous soil. The area at the time of mapping had recently burned. Shrub species, as determined from sprouts, were the same as on adjacent soils derived from the diorites, except that in some areas, only Rhus ovata and Prunus illicifolia were growing. It is possible that other species which might indicate the calcareous nature of the soil did exist but were destroyed by the fire of July 20, 1960.

The "D" soils range from neutral near the surface to alkaline from 6 or 8 inches to the hard whitish tufa at about 24 inches. The structure is strong, fine, angular, blocky at the surface to almost massive below 16 to 18 inches. The consistency is soft when dry near the surface and slightly hard when dry in the subsoil. When moist, "D" is friable to firm throughout the profile. Depths are usually over 2 feet, measured vertically. In some places the calcareous tufa is exposed at the surface.

Soil profile.--

1.	0-6 inches	Light yellowish brown (10YR6/4 dry, 10YR 5/6 moist) gravelly, sandy loam; strong, fine, angular, blocky structure; soft when dry to friable when moist; neutral; 1 to 6 inches thick; gradual, wavy lower boundary.
2.	7-16 inches	A mixture of grayish brown, brownish yellow, pale yellow (10YR5/2 moist, 10YR6/8 moist, 2.5Y8/4 moist) heavy clay loam; strong, fine,

5/ Tentative series, not correlated.

6/ Bean, Robert T. Geology of the Big Dalton and Little Dalton watersheds. p. 2, 1943. (Unpublished report on file Pacific SW. Forest & Range Expt. Sta., U.S. Forest Serv., Berkeley, Calif.)

2. (con.) angular, blocky structure; slightly hard when dry to firm when moist; neutral to alkaline; 8 to 12 inches thick; clear, abrupt lower boundary.

3. 17-22 inches A mixture of grayish brown, brownish yellow, pale yellow, and white (white the most common) (10YR5/2 moist, 10YR6/8 moist, 2.5Y8/2 moist) sandy clay loam; moderate, medium, angular, blocky to almost massive structure; slightly hard when dry to friable when moist, alkaline; 6 to 12 inches thick; gradual, irregular lower boundary.

4. 23- inches Calcareous tufa, somewhat porous.

Range in characteristics.--From about 6 inches to the tufa, the soil series is a mixture of yellows, grays, whites, and a touch of red. The yellow and gray colors probably reflect the poor drainage which is typical of this soil. Texture ranges from a sandy loam near the surface to a heavy clay loam near the parent material. Not enough of this soil has been found to indicate a range of characteristics. It is of interest only as a curiosity.

Topography.--Slopes are gentle. The soil was found at about 3,000 feet near the head of Volfe Canyon, but it may be expected to occur at lower or even higher elevations where tufa is formed.

Drainage and permeability.--This soil is imperfectly to poorly drained. Moisture was present at the time of mapping in early fall. This moisture is attributed to springs and a high water table in this immediate vicinity.

Vegetation.--Chaparral. Rhus ovata and Prunus illicifolia are the most common species. Photinia arbutifolia and Adenostoma fasciculatum were also observed.

Use.--Watershed protection; cover and browse for wildlife.

Distribution.-- The distribution of this series is impossible to determine. The soil certainly is limited but can be expected to occur near the head of canyons, along stream courses, or where springs might be expected to occur throughout the foothills and middle elevations of the San Gabriel Mountains in southern California.

Type location.--Sec. 2, T1N, R9W, San Bernardino Meridian. Head of Volfe Canyon along trail, 0.2 miles northeast of burned cabin.

"E" SERIES[7/]

The "E" soils are moderately coarse-textured to medium textured, well-drained, fairly deep soils, developed mostly from a heavily weathered schist. In places the parent material is gneissic; elsewhere it is somewhat andesitic or basaltic. "E" soil occurs in the higher foothills on fairly gentle to slightly steep slopes; it is commonly associated with "F" soil, which occurs on a purplish andesite. The "E" soils usually have more than 10 percent surface rockiness, but may be stony or non-stony. "E" soil somewhat resembles the deeper "A" soil, and closely resembles the Tyson soils on Franciscan sandstone in northwestern California.

The "E" soils rank among the better soils in the San Dimas area, being generally more than 3 or 4 feet deep. They often support good stands of hardwoods or tall dense brush.

Soil profile.--

1.	0-6 inches	Grayish brown (2.5Y5/2 dry, 10YR3/2 moist) sandy loam; strong, fine, angular, blocky structure; slightly hard when dry to very friable when moist; very slightly acid to neutral; 4 to 8 inches thick; abrupt, smooth lower boundary.
2.	7-20 inches	Pale brown (10YR6/3 dry, 10YR3/3 moist) sandy loam to sandy, clay loam; strong, medium, angular, blocky structure; hard when dry to very friable when moist; slightly acid; 1 to 2 feet thick; clear, wavy lower boundary.
3.	21-44 inches	Pale brown (10YR6/3 dry, 10YR3/3 moist) gravelly, sandy loam; strong, medium, angular, blocky structure; hard when dry to very friable when moist; slightly acid, 1-1/2 to 2 feet thick; diffuse lower boundary.
4.	45- inches	Heavily weathered schist; sometimes andesitic parent material.

Range in characteristics.--This soil is generally pale brown or grayish brown, with little color variation throughout the profile or between different profiles. Depths, on the whole, surpass 3 feet, although a number of areas are shallow and rocky. The soil is fairly free of stones in the profile, except in the shallow rockier phases. The pH, which is generally slightly acid, varies little.

Topography.--Slopes are almost flat or gentle to moderately steep, the deeper soils occurring on the gentler slopes. Elevations range from 2,000 to 3,500 feet.

7/ Tentative series, not correlated.

Drainage and permeability.--The "E" soils are well-drained and have a fairly high water-holding capacity.

Vegetation.--Chaparral and hardwoods. Quercus agrifolia, Photinia arbutifolia, Rhus diversiloba, and Vicia sp. grow on the deeper phases. Eriogonum sp., Quercus dumosa, Salvia mellifera, Garrya fremontii and various annual grasses grow on the shallower phases.

Use.--Watershed protection; cover and browse for wildlife.

Distribution.--Foothills and medium elevations of San Gabriel Mountains in Los Angeles County.

Type location.--Sec. 23, T1N, R9W, San Bernardino Meridian, near intersection of Bluebird Truck Trail and road to Johnstone Lookout, about 500 feet from Lookout.

Remarks.--This soil would probably respond well to conversion to grass, but it is not extensive and hence may not be important in land management.

"F" SERIES[8/]

The "F" soils are fine-textured to moderately fine-textured, deep soils developed from andesite. They occur in the lower foothils of the San Gabriel Mountains from 1,500 to 2,000 feet elevation. "F" soil is probably the best soil for conversion to grass within the entire San Dimas area. It occurs on flat and gentle to moderately steep slopes. The soil probably can support a dense cover of brush, trees, or grass. It seems very stable, although slipping may occur in some areas. Because of the deep soil and the high clay content, the "F" soils have a high water-holding capacity.

Ranging from very slightly acid near the surface to medium acid near the parent material, these soils generally are not stony or gravelly. The deeper phases show considerable clay development. In some areas there is a foot of dense clay, probably montmorillonite in the subsoil.

The "F" soils have strong, medium, subangular, blocky to strong, coarse, subangular blocky structure. Their consistency is soft when dry and friable when moist near the surface. The consistency in the subsoil varies from very hard to extremely hard when dry, and is firm when moist. Depths are commonly greater than 3 feet.

Soil profile.--

1. 0-5 inches — Dark grayish brown (10YR4/2 dry, 10YR3/2 moist) sandy clay loam; strong, medium, subangular, blocky structure; soft when dry to

8/ Tentative series, not correlated.

1. (con.)		friable when moist; slightly acid to very slightly acid; 2 to 6 inches thick; clear, abrupt lower boundary.
2.	6-14 inches	Brown (10YR5/3 dry, 10YR3/3 moist) clay loam; strong, medium, subangular, blocky structure; very hard when dry to firm when moist; slightly acid; 6 to 12 inches thick; gradual, wavy lower boundary.
3.	15-32 inches	Dark brown (10YR4/3 dry, 10YR3/3 moist) clay; strong, coarse, subangular, blocky structure; extremely hard when dry to very firm when moist; medium acid; 12 to 24 inches thick; gradual, irregular lower boundary.
4.	33-45 inches	Dark brown (10YR4/3 dry, 10YR3/3 moist) gravelly clay loam; strong, coarse, subangular, blocky structure; very hard when dry to firm when moist; medium acid to strongly acid; 10 to 15 inches thick; diffuse lower boundary.
5.	46- inches	A basic volcanic rock, probably andesite.

Range in characteristics.--The "F" soils are somewhat purplish. Surface colors range from dark brown to dark grayish-brown; subsoil colors are generally dark brown. Subsoil textures range from a clay to a clay loam. The surface may be quite rocky with many boulder outcrops, although generally the soil is fairly rock-free. Depths range from 2 to 5 feet, but generally exceed 3 feet.

Topography.--Slopes are usually flat to gentle or slightly steep. Elevation ranges from 1,500 to 2,500 feet.

Drainage and permeability.--The "F" soils appear to be moderately well-drained and capable of holding large amounts of water.

Vegetation.--Chaparral and hardwood-grass. Garrya fremontii, Rhus diversiloba, Quercus dumosa, Salvia mellifera, and Rhus ovata are common shrubs. Quercus agrifolia is a common hardwood and Umbellularia californica and Juglans californica are sometimes found.

Use.--Watershed protection; browse and cover for wildlife.

Distribution.--Foothills of southern San Gabriel Mountains in Los Angeles County.

Type location.--Sec. 22, T1N, R9W, San Bernardino Meridian. Along Bluebird Truck Trail, 300 feet south of junction of road to Sycamore Flat.

Remarks.--It is unfortunate that this soil is not more prevalent. The "F" series is probably the most fertile soil in the San Dimas area and will probably give the best results in any type of management.

"G" SERIES[9/]

The "G" soils are moderately coarse-textured to medium-textured, deep soils developed from diorites, schists, gneiss, and associated rocks at elevations above 4,000 to 4,500 feet. This soil is generally covered by tall dense shrubs and hardwoods. Considerable big-cone Douglas-fir (Pseudotsuga macrocarpa) grows on steep colluvial slopes.

A shallow rocky phase of this soil occurs on steep south slopes. Here they closely resemble "A" soils under similar aspect and slope. Somewhat more acid than the "A" soils, they have better structure. However, in spite of many resemblances to "A", these shallow rocky soils are more like the typical "G" soil.

The "G" soils have developed under conditions of low temperatures and fairly high precipitation, much of it as snow. The ground may be frozen for short periods during winter. Moisture may be present in the subsoil throughout the year in deep soils on northern slopes.

These soils range from slightly acid near the surface to medium acid and strongly acid near the parent material. The deeper "G" soils (more than 4 feet) are generally strongly acid below 30 inches.

The "G" soils have moderate, medium, granular structure in the surface horizon to strong, medium, angular, blocky structure in the subsoil. Consistency is soft when dry to very friable when moist near the surface, and hard when dry to friable when moist in the subsoil. Depths range from 1 foot on south-facing rocky slopes to more than 5 feet on north-facing gentle slopes.

Soil profile.--

1.	0-6 inches	Brown (10YR5/3 dry, 10YR3/2 moist) sandy loam; moderate, medium, granular structure; soft when dry to very friable when moist; slightly acid; 2 to 8 inches thick; clear, abrupt lower boundary.
2.	7-12 inches	Light yellowish brown (10YR6/4 dry, 10YR4/4 moist) sandy loam to sandy silt loam; strong, fine, angular, blocky structure; slightly hard when dry to friable when moist; medium acid; 4 to 10 inches thick; gradual, wavy lower boundary.

9/ Tentative series, not correlated.

3. 13-30 inches — Light yellowish brown (10YR6/4 dry, 10YR5/6 moist) gravelly, sandy loam to gravelly silt loam; hard when dry to friable when moist; medium acid to strongly acid; 12 to 24 inches thick; gradual, irregular lower boundary.

4. 31-54 inches — Yellowish brown (10YR5/4 dry, 10YR4/6 moist) gravelly, sandy loam to gravelly, sandy silt loam; hard when dry to friable when moist; medium acid to strongly acid; 8 to 20 inches thick; diffuse lower boundary.

5. 55- inches — Igneous amd metamorphosed rock, mostly schists, diorites, and gneiss.

Range in characteristics.--These soils are usually more than 3 feet deep, sometimes more than 5 feet, measured vertically. On south slopes, "G" soil may be less than 2 feet deep. It is strongly acid to medium acid in the subsoil. Its color is generally a light yellowish brown or yellowish brown, but is very pale brown in some areas. Texture ranges from sandy loam to sandy silt loam. The "G" soils are typically stony and rocky. Colluvial areas on steep slopes are common.

Topography.--Slopes are generally steep to extremely steep. Elevation ranges from 4,000 to over 5,500 feet.

Drainage and permeability.--The "G" soils are well-drained and are capable of retaining large amounts of water.

Vegetation.--Chaparral, hardwood, and conifers. Common shrubs are Arctostaphylos glauca, Ceanothus leucodermis, Quercus wislizenii, Haploppapus sp., Lupinus sp., Penstemon sp., and Salvia mellifera. Quercus chrysolepis is a common hardwood. Pseudotsuga macrocarpa, Pinus ponderosa (at Browns Flat), and an occasional Abies concolor are the conifers that grow on this soil.

Use.--Watershed protection; browse and cover for wildlife.

Distribution.--Middle elevations in San Gabriel Mountains in Los Angeles County.

Type location.--Sec. 15, T1N, R8W, San Bernardino Meridian. Along road near head of Evey Canyon, 150 feet west of saddle.

Remarks.--Climate and soil depth indicate that this soil would support perennial grasses. Moisture was present at depths of 4 feet on north slopes at an elevation of 4,600 feet. "G" soil in many respects resembles forest soil. Many areas support a commercial stand of conifers. Ponderosa pine site trees measured at Browns Flat show a site index of 150 at 300 years of age on alluvial areas derived from this soil.

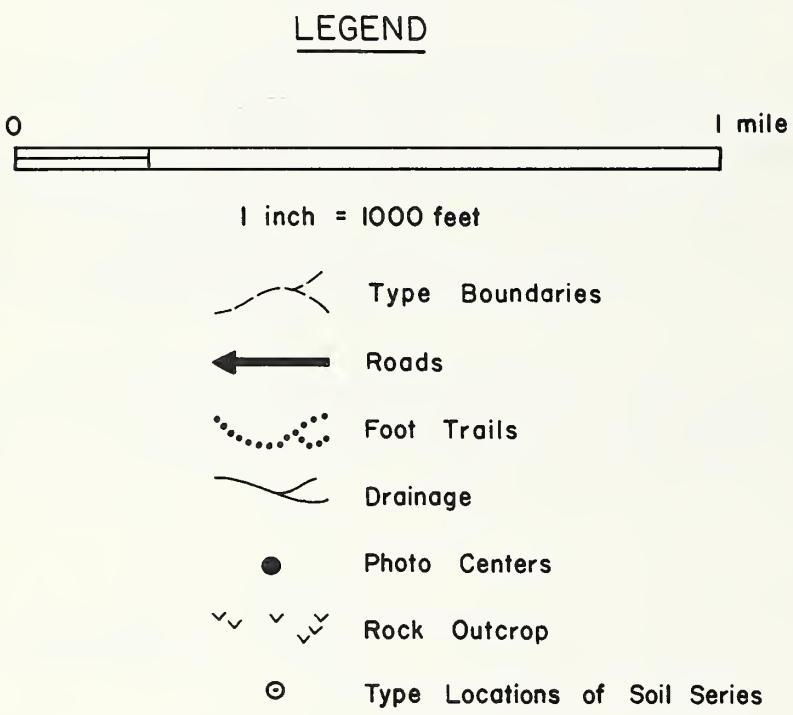
SUMMARY

The soils of the San Dimas Experimental Forest were mapped according to standard soils series criteria. Each of seven series was tentatively designated by a capital letter. The soils of the experimental forest are derived chiefly from a coarse-grained igneous-metamorphic complex of rocks. A few small areas in the southern part developed from fine-grained volcanic rocks.

The largest part of the experimental forest has a very shallow soil cover. This "A" soil intergrades into "G" around 4,000 feet. Above that elevation "G" is the most common soil. Somewhat resembling "A" and often associated with it is "B", a deeper soil that generally occurs on the gentler slopes and has little or no quartz. "C" is commonly found on ridges, surrounded by "A" or "B" on the slopes below. "C" is reddish in color and has some development and varying amounts of quartz. "E" resembles "C", but has less development and is less red. "F" occurs on basalt and differs from all the other soils in its greater depth and degree of development. "D" developed from calcareous tufa deposits found in several parts of the forest.

"F" soil supports the best grass cover. "B" or "E" soils may be rated second. The deeper phases of "G" compare favorably with "B" because of the higher rainfall and lower temperatures prevalent on "G" soils. "D" soil is of little importance because of its limited occurrence. Fair vegetative growth may be expected from "C". "A" soil, the most important series because of its larger area, will cause the most problems in establishing and maintaining a cover owing to its extreme shallowness and the steep slopes.

Figure 1.--Soils of the San Dimas Experimental Forest in southern California were mapped with the aid of aerial photographs.

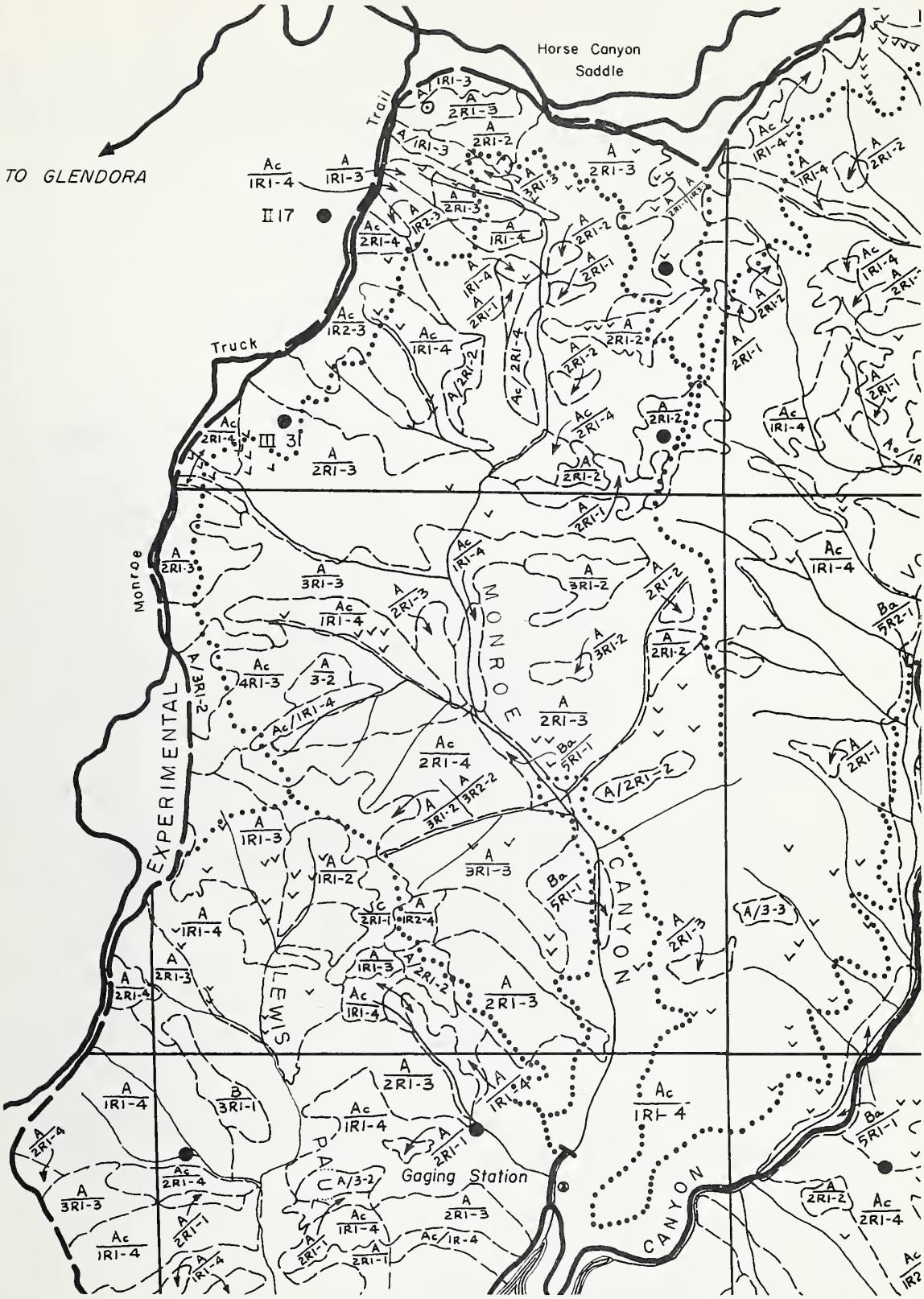


Cooperating Agencies

Pacific Southwest Forest and Range Experiment Station, J.Bentley, 1960.
Department of Forestry, University of California, P.Zinke, R.Colwell, 1960.
U.S. Forest Service — California Region, K.Bradshaw, 1960.

Classification and mapping by: J.Crawford, O.Dominguez, 1960.

Map compilation: by: J.Klingensmith, 1960.


TO GLENDORA
Horse Canyon
Saddle
Trail
Truck
Monroe
EXPERIMENTAL
MONROE
LEWIS
CANYON
CANYON
Gaging Station

SOILS MAP LEGEND

The soils of the San Dimas Experimental Forest were mapped according to standard soil series criteria. Descriptions of soil series, phase, depth class, surface rockiness, and slope class are represented in fractional symbols:

$$\frac{\text{Soil series, soil phase}}{\text{Soil depth class, surface rockiness, slope class}}$$

Soil series (represented by large letter in numerator):

A, B, C, D, E, F, G.

- Subsoil fine-textured or moderately fine-textured
  - Subsoil alkaline and calcareous — D
  - Subsoil not alkaline and not calcareous
    - Subsoil somewhat purplish, slopes gentle — F
    - Subsoil slightly reddish, fine quartz grains present — C
- Subsoil coarse-textured to medium-textured
  - Generally above 4,000 feet, subsoil strongly acid — G
  - Generally below 4,000 feet, subsoil not strongly acid
    - Very shallow, less than 24 inches; texture a loose sand or loamy sand — A
    - Deeper than 24 inches, texture not a loose sand or loamy sand
      - Texture generally a silty sandy loam, subsoil yellowish-brown, occurs mainly on gneiss — B
      - Texture a sandy loam or clay loam, subsoil pale brown, occurs on andesite and schists — E

Soil phase (represented by small letter in numerator):

a = alluvial
c = colluvial

Soil depth class (represented by first number in denominator):

1 = 0-11 inches
2 = 12-23 inches
3 = 24-35 inches
4 = 36-47 inches
5 = 48- inches

Amount of surface rockiness (represented by letter and number in denominator):

R1 = > 10 percent of surface with rocks > 3 inches diameter, and < 10 percent of surface with rocks > 24 inches diameter.
R2 = 10-50 percent of surface with rocks > 24 inches diameter.
R3 = > 50 percent of surface with rocks > 3 inches diameter.

Slope class (represented by last number in denominator):

1 = 0-39 percent
2 = 40-54 percent slope
3 = 55-69 percent slope
4 = 70- percent slope

Crawford, James M., Jr.
1962. Soils of the San Dimas Experimental Forest. U.S.Forest Serv.. Pacific SW. Forest & Range Expt. Sta. Misc. Paper 76. 20 pp., illus.

The soils of the San Dimas Experimental Forest in southern California were mapped after a wildfire on July 20, 1960. Seven tentative soil series were mapped with the aid of aerial photographs taken immediately after the fire. A very shallow soil, found chiefly on steep slopes, covers the largest part of the experimental forest. Fairly deep soils occur on gentle to slightly steep slopes. The deep soils of the lower foothills of the San Gabriel Mountains and at elevations above 4,000 feet can support the best vegetative cover.

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