United States Department of Agriculture

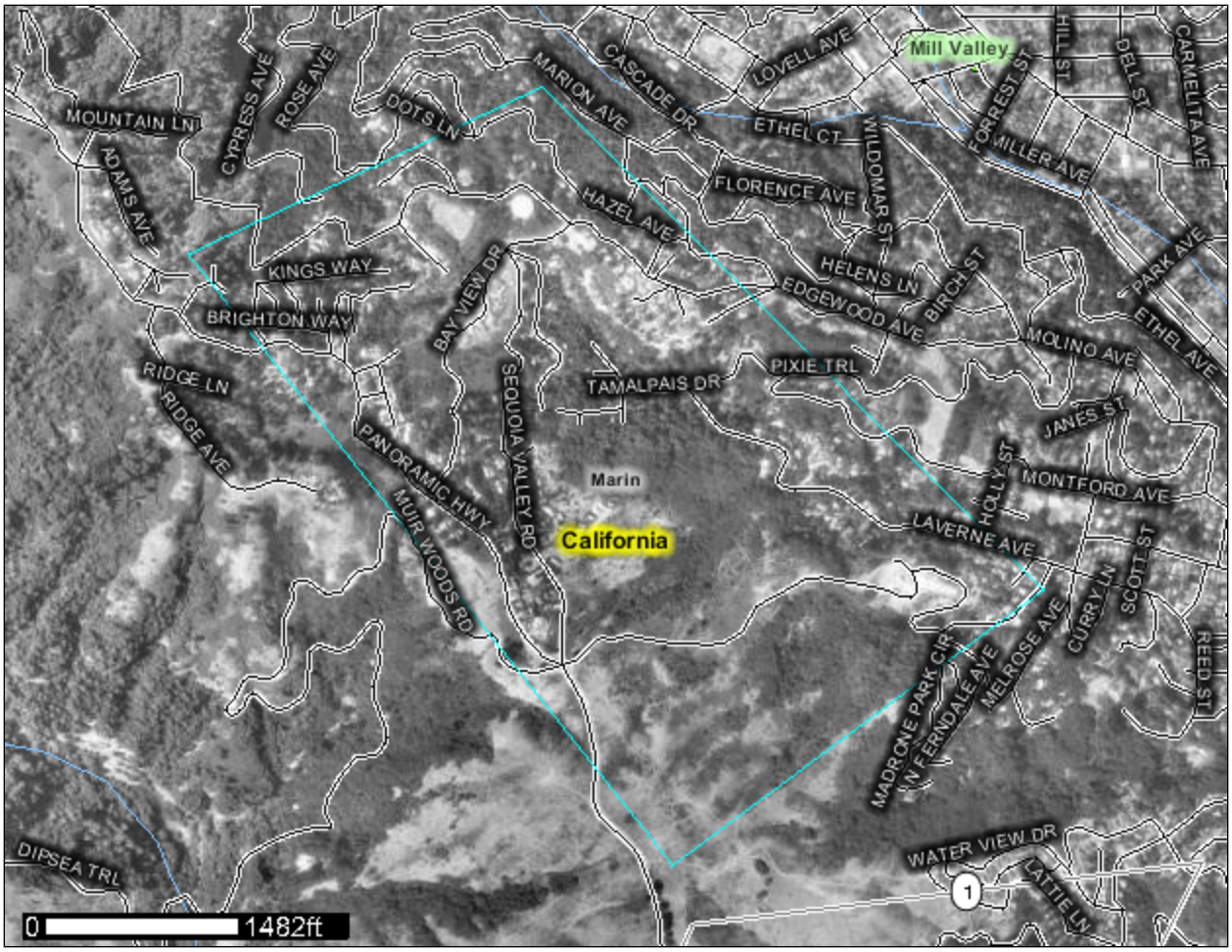
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Marin County, California

Homestead Valley



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....4
Soil Map.....6
Soil Map.....7
Legend.....8
Map Unit Legend.....9
Map Unit Descriptions.....9
Marin County, California Version date:12/10/2007 5:08:37 PM.....12
107—BONNYDOON GRAVELLY LOAM, 30 TO 75 PERCENT SLOPES.....12
116—CRONKHITE-BARNABE COMPLEX, 15 TO 30 PERCENT SLOPES.....13
117—CRONKHITE-BARNABE COMPLEX, 30 TO 50 PERCENT SLOPES.....15
164—SAURIN-BONNYDOON COMPLEX, 50 TO 75 PERCENT SLOPES.....16
177—TAMALPAIS-BARNABE VARIANT VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES.....18
179—TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES.....20
181—TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 15 TO 30 PERCENT SLOPES.....21
182—TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 30 TO 50 PERCENT SLOPES.....23
204—XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES.....25
References.....27

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

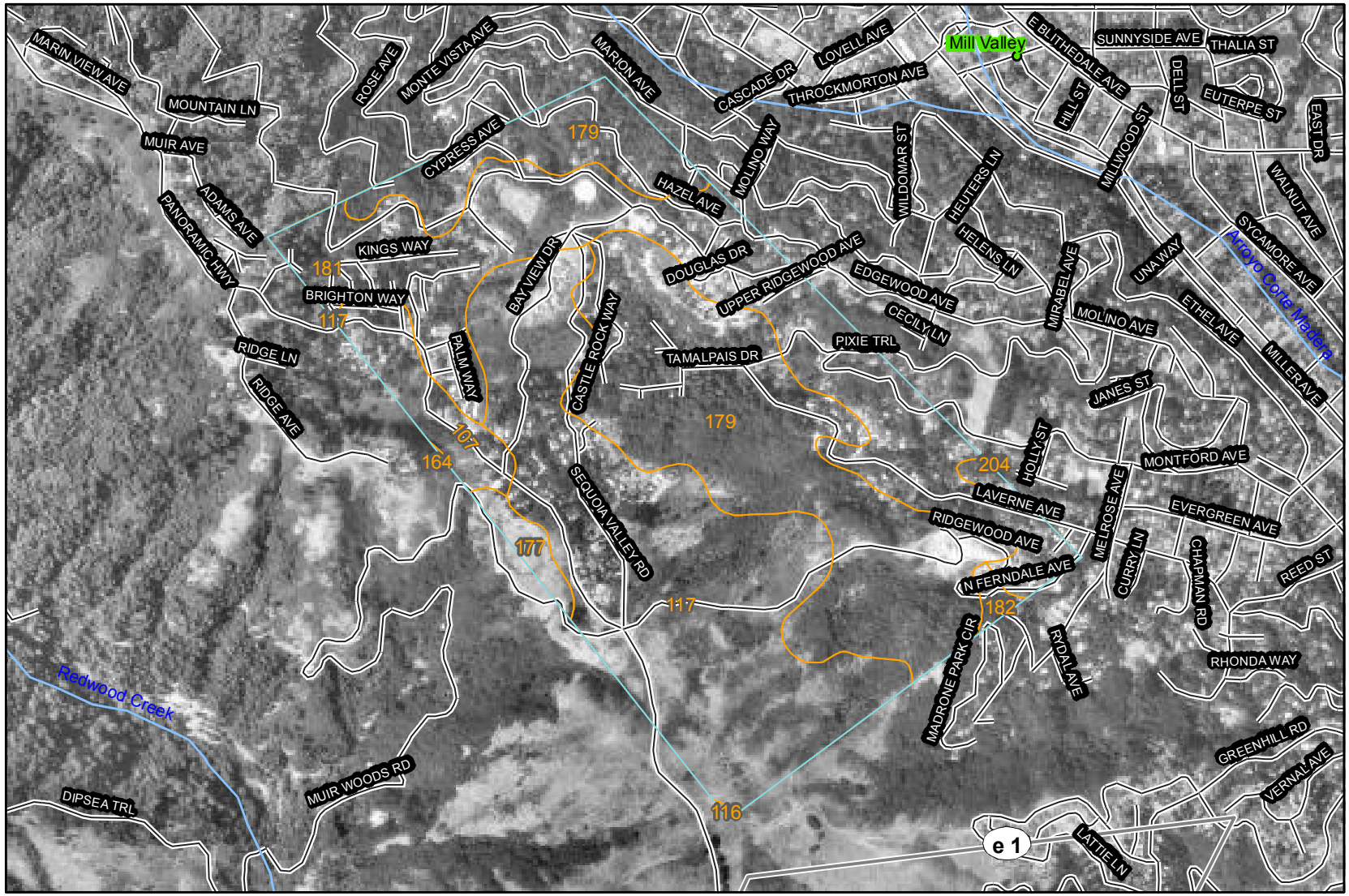
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Municipalities

Cities

Urban Areas

Water Features

Oceans

Streams and Canals

Transportation

Rails

Roads

Interstate Highways

US Routes

State Highways

Local Roads

Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marin County, California
Survey Area Data: Version 5, Dec 10, 2007

Date(s) aerial images were photographed: 8/25/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Marin County, California (CA041)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
107	BONNYDOON GRAVELLY LOAM, 30 TO 75 PERCENT SLOPES	17.4	4.3%
116	CRONKHITE-BARNABE COMPLEX, 15 TO 30 PERCENT SLOPES	0.2	0.0%
117	CRONKHITE-BARNABE COMPLEX, 30 TO 50 PERCENT SLOPES	135.8	33.2%
164	SAURIN-BONNYDOON COMPLEX, 50 TO 75 PERCENT SLOPES	0.1	0.0%
177	TAMALPAIS-BARNABE VARIANT VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES	5.5	1.3%
179	TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES	137.6	33.7%
181	TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 15 TO 30 PERCENT SLOPES	108.3	26.5%
182	TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 30 TO 50 PERCENT SLOPES	2.3	0.6%
204	XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES	1.6	0.4%
Totals for Area of Interest (AOI)		408.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

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

for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of

the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Marin County, California Version date:12/10/2007 5:08:37 PM

107—BONNYDOON GRAVELLY LOAM, 30 TO 75 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 270 to 320 days

Map Unit Composition

Bonnydoon and similar soils: 85 percent
Minor components: 15 percent

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from shale, or sandstone

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e
Ecological site: SHALLOW GRAVELLY LOAM (R015XC037CA)

Typical profile

0 to 15 inches: Gravelly loam
15 to 19 inches: Weathered bedrock

Minor Components

Unnamed shallow

Percent of map unit: 3 percent

Slopes less than 30 percent

Percent of map unit: 2 percent

Saurin

Percent of map unit: 2 percent

Tocaloma
Percent of map unit: 2 percent

Rock outcrop
Percent of map unit: 2 percent

Felton variant
Percent of map unit: 2 percent

Soulajule
Percent of map unit: 2 percent

116—CRONKHITE-BARNABE COMPLEX, 15 TO 30 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 800 feet
Mean annual precipitation: 24 to 35 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 275 to 300 days

Map Unit Composition

Cronkhite and similar soils: 50 percent
Barnabe and similar soils: 30 percent
Minor components: 20 percent

Description of Cronkhite

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e
Ecological site: COASTAL LOAMY CLAYPAN (R015XC028CA)

Typical profile

0 to 15 inches: Loam
15 to 26 inches: Clay loam
26 to 45 inches: Clay loam

45 to 55 inches: Weathered bedrock

Description of Barnabe

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or chert

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 8 inches: Very gravelly loam
8 to 16 inches: Very gravelly loam
16 to 20 inches: Bedrock

Minor Components

Centissima

Percent of map unit: 4 percent

Dipsea

Percent of map unit: 4 percent

Slopes less than 15 percent

Percent of map unit: 3 percent

Henneke

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

Maymen

Percent of map unit: 1 percent

Maymen variant

Percent of map unit: 1 percent

Unnamed shallow

Percent of map unit: 1 percent

Slumps

Percent of map unit: 1 percent

Unnamed mod. deep

Percent of map unit: 1 percent

117—CRONKHITE-BARNABE COMPLEX, 30 TO 50 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 800 feet
Mean annual precipitation: 24 to 35 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 275 to 300 days

Map Unit Composition

Cronkhite and similar soils: 40 percent
Barnabe and similar soils: 30 percent
Minor components: 30 percent

Description of Cronkhite

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e
Ecological site: COASTAL LOAMY CLAYPAN (R015XC028CA)

Typical profile

0 to 15 inches: Loam
15 to 26 inches: Clay loam
26 to 45 inches: Clay loam
45 to 55 inches: Weathered bedrock

Description of Barnabe

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or chert

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 8 inches: Very gravelly loam
8 to 16 inches: Very gravelly loam
16 to 20 inches: Bedrock

Minor Components

Centissima

Percent of map unit: 4 percent

Dipsea

Percent of map unit: 4 percent

Slopes less than 30 percent

Percent of map unit: 4 percent

Slumps

Percent of map unit: 4 percent

Maymen

Percent of map unit: 4 percent

Maymen variant

Percent of map unit: 3 percent

Unnamed shallow

Percent of map unit: 3 percent

Unnamed mod. deep

Percent of map unit: 3 percent

Rock outcrop

Percent of map unit: 1 percent

164—SAURIN-BONNYDOON COMPLEX, 50 TO 75 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 1,500 feet
Mean annual precipitation: 25 to 40 inches

Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 270 to 320 days

Map Unit Composition

Saurin and similar soils: 50 percent
Bonnydoon and similar soils: 40 percent
Minor components: 8 percent

Description of Saurin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e
Ecological site: LOAMY (R015XC034CA)

Typical profile

0 to 10 inches: Clay loam
10 to 33 inches: Clay loam
33 to 37 inches: Weathered bedrock

Description of Bonnydoon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water capacity: Very low (about 1.4 inches)

Interpretive groups
Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e
Ecological site: SHALLOW GRAVELLY LOAM (R015XC037CA)

Typical profile
0 to 11 inches: Gravelly loam
11 to 15 inches: Weathered bedrock

Minor Components

Tocaloma
Percent of map unit: 2 percent

Unnamed shallow
Percent of map unit: 2 percent

Los osos
Percent of map unit: 2 percent

Unnamed dark surface
Percent of map unit: 2 percent

177—TAMALPAIS-BARNABE VARIANT VERY GRAVELLY LOAMS, 50 TO 75 PERCENT SLOPES

Map Unit Setting
Elevation: 40 to 800 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 300 to 365 days

Map Unit Composition
Tamalpais and similar soils: 50 percent
Barnabe variant and similar soils: 40 percent
Minor components: 7 percent

Description of Tamalpais

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone, or chert

Properties and qualities
Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.7 inches)

Interpretive groups
Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7s
Ecological site: COASTAL GRAVELLY LOAM (R015XC027CA)

Typical profile
0 to 19 inches: Very gravelly loam
19 to 39 inches: Very gravelly clay loam
39 to 43 inches: Unweathered bedrock

Description of Barnabe Variant

Setting
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or chert

Properties and qualities
Slope: 50 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.2 inches)

Interpretive groups
Land capability classification (irrigated): 7e
Land capability (nonirrigated): 7e
Ecological site: COASTAL SHALLOW GRAVELLY LOAM (R015XC029CA)

Typical profile
0 to 13 inches: Very gravelly loam
13 to 17 inches: Unweathered bedrock

Minor Components

Barnabe
Percent of map unit: 2 percent

Cronkhite
Percent of map unit: 2 percent

Rock outcrop
Percent of map unit: 2 percent

Unnamed loam soils
Percent of map unit: 1 percent

179—TOCALOMA-MCMULLIN COMPLEX, 30 TO 50 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 1,500 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 55 to 61 degrees F
Frost-free period: 290 to 330 days

Map Unit Composition

Tocaloma and similar soils: 40 percent
Mcmullin and similar soils: 35 percent
Minor components: 19 percent

Description of Tocaloma

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 19 inches: Loam
19 to 39 inches: Very gravelly loam
39 to 43 inches: Weathered bedrock

Description of Mcmullin

Setting

Landform: Hills, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from conglomerate

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 4 inches: Gravelly loam
4 to 18 inches: Gravelly loam
18 to 22 inches: Unweathered bedrock

Minor Components

Saurin

Percent of map unit: 5 percent

Unnamed dark surface

Percent of map unit: 5 percent

Unnamed shallow

Percent of map unit: 5 percent

Los osos

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

181—TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 15 TO 30 PERCENT SLOPES

Map Unit Setting

Elevation: 50 to 1,500 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 290 to 330 days

Map Unit Composition

Tocaloma and similar soils: 30 percent
Urban land: 25 percent
Mcmullin and similar soils: 25 percent
Minor components: 12 percent

Description of Tocaloma

Setting

Landform: Hills
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e

Typical profile

0 to 19 inches: Loam
19 to 39 inches: Very gravelly loam
39 to 43 inches: Weathered bedrock

Description of Mcmullin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from conglomerate

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 4 inches: Gravelly loam
4 to 18 inches: Gravelly loam
18 to 22 inches: Unweathered bedrock

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): 8
Land capability (nonirrigated): 8

Minor Components

Xerorthents

Percent of map unit: 2 percent

Saurin

Percent of map unit: 2 percent

Dipsea

Percent of map unit: 2 percent

Unnamed shallow

Percent of map unit: 2 percent

Slopes less than 15 percent

Percent of map unit: 2 percent

Slopes more than 30 percent

Percent of map unit: 2 percent

182—TOCALOMA-MCMULLIN-URBAN LAND COMPLEX, 30 TO 50 PERCENT SLOPES

Map Unit Setting

Elevation: 10 to 1,500 feet
Mean annual precipitation: 25 to 40 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 250 to 330 days

Map Unit Composition

Tocaloma and similar soils: 40 percent
Urban land: 20 percent
Mcmullin and similar soils: 20 percent
Minor components: 12 percent

Description of Tocaloma

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability (nonirrigated): 4e

Typical profile

0 to 19 inches: Loam
19 to 39 inches: Very gravelly loam
39 to 43 inches: Weathered bedrock

Description of Mcmullin

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from conglomerate

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability (nonirrigated): 6e

Typical profile

0 to 4 inches: Gravelly loam
4 to 18 inches: Gravelly loam
18 to 22 inches: Unweathered bedrock

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear

Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): 8
Land capability (nonirrigated): 8

Minor Components

Xerorthents

Percent of map unit: 2 percent

Saurin

Percent of map unit: 2 percent

Dipsea

Percent of map unit: 2 percent

Unnamed shallow

Percent of map unit: 2 percent

Slopes less than 30 percent

Percent of map unit: 2 percent

Slopes more than 50 percent

Percent of map unit: 2 percent

204—XERORTHENTS-URBAN LAND COMPLEX, 0 TO 9 PERCENT SLOPES

Map Unit Setting

Elevation: 0 to 500 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 270 to 350 days

Map Unit Composition

Xerorthents and similar soils: 45 percent
Urban land: 40 percent
Minor components: 14 percent

Description of Xerorthents

Setting

Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Earth spread deposits

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): 8s
Land capability (nonirrigated): 8s

Description of Urban Land

Setting

Landform: Tidal flats, valley floors
Landform position (two-dimensional): Backslope

Interpretive groups

Land capability classification (irrigated): 8
Land capability (nonirrigated): 8

Minor Components

Hydraquents

Percent of map unit: 2 percent
Landform: Tidal flats
Landform position (two-dimensional): Backslope

Ballard

Percent of map unit: 2 percent

Blucher

Percent of map unit: 2 percent

Cole

Percent of map unit: 2 percent

Slopes more than 9 percent

Percent of map unit: 2 percent

Unnamed briefly flooded soils

Percent of map unit: 2 percent

Novato

Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

Reyes

Percent of map unit: 1 percent
Landform: Salt marshes
Landform position (two-dimensional): Backslope

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://soils.usda.gov/

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://soils.usda.gov/

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://soils.usda.gov/

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.glti.nrcs.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://soils.usda.gov/

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://soils.usda.gov/

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.