Soil Survey of

Walnut Gulch Experimental Watershed, Arizona

A Special Report
Revised in 2008

This report was updated from the original 1993 by William E. Emmerich in 2008. The report was edited, additional information added, and soil series nomenclature was brought to 2000 conventions. An addendum was added to include detailed soil series pedon data collected in 1985 and other soil pedon data available.

Additional soils information is available in the Soil Survey of Cochise County, Arizona Douglas-Tombstone Part, available at: http://soils.usda.gov/survey/online_surveys/arizona/index.html.

United States
Department of Agriculture
Soil Conservation Service
and
Agricultural Research Service
in cooperation with
Arizona Agricultural
Experiment Station,
and University of Arizona

Walnut Gulch Experimental Watershed, Arizona

This soil survey is a publication 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 agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in June 1993. Soil names and descriptions were approved in December 1993. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1993. This survey was made cooperatively by the Soil Conservation Service, the Agricultural Research Service, the Agricultural Experimental Station and the University of Arizona. This survey was made to obtain information needed in the research program of the Agricultural Research Service. This special report was prepared to make the information more readily available to them.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Contents

Foreword

This soil survey contains information that can be used in land-planning programs in the survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Ranchers and research scientists can use it to evaluate the potential of the soil and the management needed for maximum range production and experiment site selection. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey soils are poorly suited to use as septic tank absorption fields.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each mapping unit is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Humberto Hernandez

State Conservationist
Soil Conservation Service

Soil Survey of

Walnut Gulch Experimental Watershed, Arizona

By Donald J. Breckenfeld, Soil Conservation Service

Additional editing and data provided by William E. Emmerich, Agricultural Research Service and Carl Glocker, Soil Conservation Service

Fieldwork by Donald J. Breckenfeld, William A. Svetlik, and Cathy E. McGuire, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Agricultural Research Service

In cooperation with Arizona Agricultural Experimental Station

Introduction

Walnut Gulch Experimental Watershed is an alluvial filled valley primarily surrounded by the Dragoon Mountains and the Tombstone Hills. Named for the trees growing along the main channel, Walnut Gulch collects water from many long, winding tributaries and delivers it to the San Pedro River in Southwestern Chochise county Arizona (Fig. 1).

The watershed consists of 15000 hectares (36,900 acres), 150 square kilometers (58 square miles) of undulating to steep shrub and grass-covered rangeland extending from the San Pedro River easward to the top of Viola Canyon in the Dragoon Mountains. There is evidence that most of the drainage basin was grassland about 100 years ago but now about two-thirds of it is predominantly shrub with varying amounts of the original grasses. The remaining third mostly in the eastern part of the Watershed is still in grass. Four main drainage systems, Home Ranch Wash, Cowan Wash, Hugh Wash, and Bennetts Draw drain the grassland area into the main channel of Walnut Gulch with many small drainages starting in the Tombstone Hills also contributing. The main channel passes to the west through Flume 1 the outlet of the watershed on to the San Pedro River.

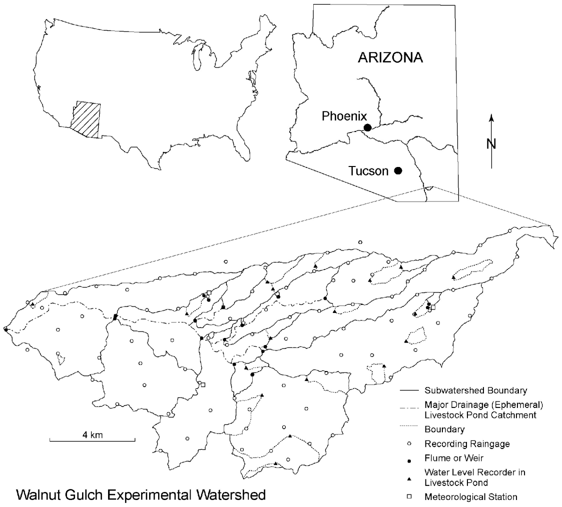

Figure 1. Location map, Walnut Gulch Experimental Watershed in southeast Arizona, USA. (Renard et al. 1993)

General Nature of the Survey Area

The following section was extracted from "Agricultural impacts in an arid environment: Walnut Gulch case study", written by K. G. Renard, L. J. Lane, J. R. Simanton, W. E. Emmerich, J. J. Stone, M. A. Weltz, D. C. Goodrich, D. S. Yakowitz.

Description

The Walnut Gulch Experimental Watershed encompasses the 58 square miles (150 square kilometers) in southeastern Arizona, U.S.A. (31 degrees, 43 minutes North and 110 degrees, 41 minutes West) (Figure 1) that surrounds the historical western town of Tombstone. The watershed is representative of the brush and grass covered rangeland found throughout the semiarid southwest and is a transition zone between the Chihuahuan and Sonoran Deserts. Elevation of the watershed ranges from 4,000 feet (1,220 m) to 6,200 feet (1890 m). Cattle grazing is the primary land use with mining, limited urbanization, and recreation making up the remaining uses. Within USDA-Agricultural Research Service (ARS) national hydrologic database, Walnut Gulch is designated as Watershed 63. With this convention, Watershed 1 at Walnut Gulch is designated as Watershed 63.001, and so on for the other subwatersheds. Two intensive study areas of particular interest are the Lucky Hills and Kendall unit source watershed areas. For more information on the research of these two watersheds see "Agricultural impacts in an arid environment: Walnut Gulch case study." by K. G. Renard, et al. (1993) (40).

Geology

The Walnut Gulch Watershed is located primarily in a high foothill alluvial fan portion of the larger San Pedro River watershed. Cenozoic alluvium is very deep and is composed of coarse-grained fragmentary material, the origin of which is readily traceable to present-day mountain flanks on the watershed. The alluvium consists of clastic materials ranging from clays and silts to well-cemented boulder conglomerates with little continuity of bedding. This alluvial fill material is more than 1312 feet (400 m) deep in places and serves as a huge ground water reservoir. Depth to ground water varies greatly in the watershed ranging from 164 feet (50 m) at the lower end to 476 feet (145 m) in the central parts of the watershed (33). Topographic expression of the alluvium is that of low undulating hills dissected by present stream channels whose routes are controlled by geologic structures. Upland slopes can be as great as 65 percent while slopes in the lower lying areas can be as small as 2 to 3 percent. Major channel slope average about 1 percent with smaller tributary channels averaging 2 to 3 percent.

The remaining mountainous portion of the watershed consists of rock types ranging in age from pre-Cambrian to Quaternary, with rather complete geologic sections. Rock types range from ridge-forming limestone to weathered granite intrusions. The geologic structural picture of mountainous area is complex, with much folding and faulting. This folding and faulting, along with igneous intrusions has resulted in large areas of shattered rock, which influence the watershed hydrology.

The watershed hydrology is, in places, controlled by past geologic events and structures. Intrusive igneous dikes in the Tombstone Hills influence ground water movement, as well as change the surface drainage. The Schieffelin granodiorite alters the course of the Walnut Gulch main stream, acts as a probable ground water barrier between the ground water in the Tombstone Hills and the deep alluvial basin, and has caused numerous small perched water tables along its perimeter. Highly compacted conglomerate beds greatly alter the path of stream channels and, in places, diverts streams at more than right angles. High angle faults form new paths for steam flow, making channels arrow-straight in some places and causing diversions in others.

Vegetation

Although historical records indicate that most of the watershed was grassland approximately 95 years ago; now shrubs dominate the lower two-thirds of the watershed (27). Major watershed vegetation includes the shrub species of creosotebush, whitethorn, tarbush, snakeweed, and burroweed; and grass species of black grama, blue grama, sideoats grama, bush muhly, and Lehmanns lovegrass. Shrub canopy cover ranges from 30 to 40 percent and grass canopy cover ranges from 10 to 80 percent. Average annual herbaceous forage production is approximately 1070 lb/acre (1200 kg/hectare).

Instrumentation

The initial rainfall and runoff instrumentation on Walnut Gulch was installed in 1954-55. The initial network of 20 precipitation recording gages was expanded in the early 1960's to the 85 gage network currently in place on the watershed (37). Five supercritical precalibrated flumes were constructed prior to 1955 to measure runoff form the heavily sediment laden ephemeral streams of Walnut Gulch. All five flumes failed or were badly damaged within two years. They failed for hydrologic, hydraulic, and structural reasons. Following extensive hydraulic model research at the ARS Outdoor Hydraulic Structures Laboratory in Stillwater, Oklahoma, the original five flumes were rebuilt using a design known as the Walnut Gulch Supercritical flume (26, 46). Six additional flumes were added later.

Runoff from small (less than 100 acres or 40 hectares) watersheds is measured using various gauging structures. These structures include broad-crested V-notch weirs, H-flumes, and supercritical flow flumes. Currently ten small watersheds are monitored. Runoff from watersheds larger than 500 acres (200 hectares) is measured with large supercritical flow flumes (46). The largest flume, at the outlet of the Walnut Gulch Watershed has a flow capacity of 172,000 gal/sec (650 cubic meters/sec). Sediment from small watersheds monitored with V-notch weirs is sampled with automatic pump samplers (2) and sediment traps above the weirs (38). Sediment from small watersheds equipped with supercritical flow flumes is sampled with a total-load automatic traversing slot sampler (41). Soil moisture within various vegetation/soil complexes throughout the watershed is measured using time domain reflectometry (61). Permanent vegetation plots and transects have been established to evaluate the impacts of management practices and global change on vegetation.

Climate

Walnut Gulch Watershed has a diverse climate ranging from the drier warmer shrub and grass covered rangeland of the western end to the mild cool Mexican oak - Pine woodlands of the Dragoon Mountains. The watershed encompasses one temperature and two moisture regimes; Ustic Aridic Thermic and Aridic Ustic Thermic.

Ustic Aridic Thermic conditions occur at elevations of 4,000 to 5,000 feet (1,220 to 1,524 meters). Mean annual air temperatures are typically 63 to 67 degrees F. (17 to 19 degrees C.) with annual precipitation of 12 to 16 inches (305 to 406 mm). Precipitation occurs as summer thundershowers and gentle winter rains. This region has 215 to 250 frost free days yearly.

Aridic Ustic Thermic conditions occur at elevations of 5,000 to 6,200 feet (1,524 to 1,890 meters). Mean annual air temperatures are 57 to 62 degrees F. (14 to 17 degrees C.) with annual precipitation of 16 to 20 inches (406 to 508 mm). Precipitation occurs as summer thunder-showers and gentle winter rains. This region has 180 to 210 frost free days yearly.

Precipitation

Precipitation varies considerable from season to season and from year to year on the Walnut Gulch Experimental Watershed. Osborn (36) reported, based on records from 1956-80, that annual precipitation varied from 6.7 inches (170 mm) in 1956 to 14.9 inches (378 mm) in 1977 (Figure 2); summer rainfall varied from 4.1 inches (104 mm) in 1960 to 11.4 inches (290 mm) in 1966; and winter precipitation varied from 1.0 inch (25 mm) in 1966-67 to 9.2 inches (233 mm) in 1978-79. Approximately two thirds of the annual precipitation on the Walnut Gulch Watershed occurs as high intensity, convective thunderstorms of limited areal extent. The moisture source for these thunderstorms is primarily the Gulf of Mexico, although Pacific Ocean storms from southwest of Arizona also produce moisture surges that result in convective storms.

Winter rains (and occasional snow) are generally low-intensity events associated with slow-moving cold fronts, and generally of greater areal extent than summer rains. Convective storms can occur during the winter as well. Runoff on the Walnut Gulch Watershed results almost exclusively from convective storms during the summer season.

The following was prepared by the National Climatic Data Center, Asheville, North Carolina.

Table V gives data on temperature and precipitation for the survey area as recorded at Tombstone, Arizona, in the period 1901 to 1993. Table W shows probable dates of the first freeze in fall and the last freeze in spring.

In winter the average temperature is 47 degrees F. (8 degrees C.) and the average daily minimum temperature is 34.5 degrees F. (1.5 degrees C.). The lowest temperature on record is 3 degrees F. (-16 degrees C.). In summer, the average temperature is 79 degrees F. (26 degrees C.) and the average daily maximum temperature is 94 degrees F. (34.5 degrees C.). The highest recorded temperature is 112 degrees F. (44 degrees C.).

Growing degree days are shown in table V. They are equivalent to ""heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F. (4.5 degrees C.)). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 14 inches (350 mm). Of this, 9.5 inches (237.5 mm), or 70 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 4.7 inches (117.5 mm). Thunderstorms most occur in July and August.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which 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. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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 flood in most years, but they cannot assure the intensity or duration of the flood or 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.

Formation of the Soils

Soil is a natural, three-dimensional body on the surface of the earth that supports plants. The soil mantle on the earth's surface is not uniform from place to place, but all soils have some things in common. They all consist of mineral, organic matter, living organisms, water, and air, all of which occur in varying amounts in different soils.

Soil results from the action of soil-forming processes on materials deposited or accumulated by geological processes. The characteristics of the soil at any given point are determined by 1) the physical and mineralogical composition of the parent material, 2) the climate under which the soil material accumulated and has existed since accumulation, 3) the plant and animal life on and in the soil, 4) the topography, or lay of the land, and 5) length of time that the forces of soil formation have acted on the parent material. (30) These factors of soil formation are independent and few generalizations can be made regarding any one factor unless the effects of the others are known (25).

Climate and vegetation are the active factors of soil genesis. They act on the parent material and slowly change it into soil material through weathering and deposition actions. The effects of climate and vegetation are conditional to the topography of the land. The parent material also affects the kind of profile that forms. Finally, time is needed for the changing of the parent material into a soil profile. Time is always required for the soil-forming factors to develop soil horizons. The more developed a profile becomes the longer the soil-forming factors have been at work.

The Walnut Gulch Experimental Watershed consists of approximately 36,562 acres (14,797 hectares) in southeastern Arizona. The watershed is very diverse in its soil types and the factors that created the soils. The area is located in the Basin and Range Physiographic Province (49) which is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys or basins. These features have resulted mainly from mid-Terriary block faulting. Up faulted blocks eroded to form mountains and pediments while the down faulted blocks filled with sediments. (32)

Parent Material

Parent material is the unconsolidated material in which the soil profile forms. It may have weathered in place from rock, or it may have been transported by water, wind or ice.

The parent material of the soils in the survey area was derived from several sources and types of bedrock. Parent material can be put into several groups: residuum, eolian, slope alluvium, fan alluvium and stream alluvium. Soils can form from a single parent material or a combination of parent materials.

Residuum is unconsolidated, weathered, or partly weathered mineral material that accumulated by the disintegration of bedrock in place. An example of a soil with this type of parent material is the Schiefflin series.

Alluvium is unconsolidated material deposited by running water including gravel, sand, silt, clay and various mixtures of these. Alluvial parent material can come from more than one source. In this survey the alluvium is differentiated by the source of the alluvium. Slope alluvium is moved from steep slopes to more gentle slopes. An example of a soil with this type of parent material is the Budlamp soil. Fan alluvium is moved along alluvial fans and fan terraces. An example of a soil with this type of parent material is the McAllister and Combate series. Stream alluvium is deposited by streams. An example of a soil with this type of parent material is the Bodecker series.

Eolian material is the sands and calcium carbonate transported by wind modifying the land surface. This transportation of sands is one of the main materials for the shrub-coppice dunes around the vegetation in this area. The wind activity of transporting calcium carbonate which is part of the carbonate enrichment process of the soils which can led to the formation of calcic and petrocalcic horizons.

Climate

Climate, past and present, has a profound and continuing effect on soil formation. Heat and moisture controls the kinds and amounts of organisms inhabiting the area (18). These factors affect the accumulation of organic matter, type and rate of weathering of the soil mineral constituents and development of diagnostic features in soil horizons. The watershed has a diverse climate ranging from the drier warmer shrub and grass covered rangeland of the western end to the moister cooler Mexican oak - Pine woodlands of the Dragoon Mountains. The survey area encompasses one temperature and two moisture regimes; Ustic Aridic Thermic, 12 to 16 inch (305 to 406 mm) precipitation zone and Aridic Ustic Thermic, 16 to 20 (406 to 508 mm) precipitation zone.

Ustic Aridic Thermic conditions occur at elevations of 4,000 to 5,000 feet (1,220 to 1,524 meters). Mean annual air temperatures are typically 63 to 67 degrees F. (17 to 19 degrees C.) with annual precipitation of 12 to 16 inches (305 to 406 mm). Precipitation occurs as summer thundershowers and gentle winter rains. This region has 215 to 250 frost free days yearly. Soils that commonly form under these conditions are well developed and have surface horizons moderately high in organic matter, but generally are not thick enough or too dry to classify in the Mollisol order. An example of a soil in this regime would be the Elgin series.

Aridic Ustic Thermic conditions occur at elevations of 5,000 to 6,200 feet (1,524 to 1,890 meters). Mean annual air temperatures are 57 to 62 degrees F. (14 to 17 degrees C.) with annual precipitation of 16 to 20 inches (406 to 508 mm). Precipitation occurs as summer thunder- showers and gentle winter rains. This region has 180 to 210 frost free days yearly. The soils range from young undeveloped soil to very old well developed soils. Soils that commonly form under these conditions have surface horizons moderately high in organic matter, and meet the thickness and moisture criteria to classify in the Mollisol order. An example of a soil in this regime would be the Budlamp series.

Plant and Animal Life

The effect of plants, animals and man is important in soil formation. Where the temperature is suitable for their growth, plants begin to grow as soon as they receive suitable amount of water and nutrients. Plants including fungi, influences soil formation by returning residues to the soil and aiding in decomposition. Plants influence the temperature of the soil by providing shade during warm periods and by helping to reduces evaporation from the soil surface. Vegetation also affect the transfer of minerals within the soil, the soil pH, and in conjunction with climate and topography, the movement of material by leaching.

Bacteria, nematodes and other forms of animal life aid in the weathering of material and the decomposition of organic matter. The larger animal such as rock squirrels, gophers, javelina, skunks, and reptiles mainly turn and mix the soil during burrowing activities destroying soil horizons.

Man can have a strong influence on soil formation. Cultural activities have disturbed the natural balance of certain factors and altered related conditions. By overgrazing with livestock and by tilling areas he has accelerated erosion. Changes in drainage conditions or topography induce by land shaping, also influences soil development. Modification of natural fertility differences by adding fertilizers, using organic residues, or cropping without replacing nutrients also alters the soil-forming processes and resulting soil characteristics.

As a rule, man, plants, animals, insects, bacteria, and fungi affect the formation of soils by increasing the organic matter content, producing gains or losses in plant nutrients, mixing soil layers, and changing structure and porosity.

Topography

Topography, as a factor of soil formation, is closely related to the other four factors. Topography and runoff influences the formation of soils through their effects on drainage, erosion, soil temperature, and plant cover. The thickness and the kinds of soil horizons depend on the amount of water that percolates through the parent material. More water normally enters a nearly level or gently sloping soil than enters a soil that is strongly sloping or steep. The survey area has a very diverse topography ranging form very steep slopes (50 percent or more) to nearly flat concave basin floor and valleys.

The amount of runoff depends on the slope and the hydrologic soil group. Steeper slopes have a higher amount of runoff than gentle slopes. Coarse-textured soils take in water more rapidly than do fine-textured soils. Therefore, less water is lost through runoff on slopes with coarse-textured soils than fine-textured ones.

Aspect affects soil formation in the moderate to high elevations. Soils are slightly deeper on the north and east facing slopes because rainfall is more effective, temperatures are cooler, and plants are more numerous.

Time

Soils of the area range from very old to very young. The kind of horizons and the degree of profile formation depend in part on how long the surface has remained stable, or how long the soil-forming processes have been active.

In this survey area, the youngest soils and the ones that show the least development are on the flood plains and alluvial fans. The parent material of these soils have been in place only a short period and is continuing to be deposited today. Examples of these soils are the Bodecker and Combate series.

Soils on the fan terraces show greater development. Deposition of parent material still occurs on alluvial fans. Fan terraces are relict alluvial fans that have been dissected and do not have active deposition of parent material. Argillic horizons have developed and carbonates are moving down through the profile. The younger soils in this is group include the Baboquivari series. The older soils in this group are generally a little higher in clay and of a redder color and would include the McAllister series.

The survey also has some very old soils found on rolling hills and high fan terraces. These soils show very well developed argillic horizons and thick calcic horizons. Some soils have petrocalcic horizons which are calcic horizons that are cemented. Examples of these soils are the Elgin, Stronghold and Sutherland series.

Some soils have buried horizons which are referred to as paleosols. This occurs when soils are allowed to develop and then are partially eroded away and then new material deposited directly over the paleosol. Example of a soil with a buried argillic/paleosol is the Bonita series.

Landforms of the Survey Area

The survey area is part of the Basin and Range Physiographic Province, which is characterized by North - South trending ranges of mountains with broad basins or valleys between the mountains. There are several drainage networks or systems in the survey area. The Home Ranch Wash, Cowan Wash, Hughs Wash, and Bennetts Draw which all feed into Walnut Gulch.

The following are landforms recognized in the survey area and some of the soils associated with them.

Flood Plains

This landform is being developed by recent Holocene and present day stream alluvium. In this survey area floodwaters flow at low to very low gradients along the basin floor and fan terraces, and tend to be elongated in nature. The soils on the flood plains receive periodic deposition of fresh alluvium resulting in an irregular decrease in organic carbon and weak to no soil development. The sediment load of this floodwater also tends to be sandy to fine. The Bodecker series developed in this type of stream alluvium. It is located just above the active streambed/riverwash and is characterized by numerous shallow braided channels.

Alluvial Fans

An alluvial fan is formed from Holocene and present day material originating from mountains and hills or other landscapes up slope. Sediment loads are deposited when slope gradients change from upland positions to lower segment on the landscape. An inherent feature of fan development is the continuously changing pattern of channels and loci of deposition. (18 pg 172) Over a long period of time these changes ensure the maintenance of fans formed by distributing material widely over the surface. (18 pg 117) The alluvial areas in this survey generally have two forms. One form is the triangular shaped fans formed from the high positioned hills or high fronts. The other form is long narrow elongated shaped fans inset between fan terraces. Soil series representing this position is the Combate series.

Basin Floors

This landform was developed during the late to mid Pleistocene when effective moisture was greater than at present time. The present day basin floor soils were formed on possibly two active landforms during the Pleistocene era. These are alluvial fans (relic alluvial flats) and lake plains (pluvial lake or playas) that are located in an enclosed basin where there is no water outlet. These two alluvial processes filled in the enclosed basin by sedimentation which increased thickness of the soil mantle. Eventually enough sediment was deposited to raise the base level and allow drainage.

The basin floor has several features. It is common for soils in this position to have several horizons representing relict palaeosols. These horizons were formed during the wetter climates of several Ice Age epics of the late Pleistocene era. Soils on the basin floor generally have some gypsum accumulation. This condition is related to a high water table at some time in the soil development processes. A typical soil that represents basin floors is the Forrest series.

Fan Terraces

This is the oldest and most stable landform developed during the early Pleistocene to early Holocene. On this position soils exhibit different degrees of pedogenic (soil) development. The soils on this landform are characterized by well developed argillic horizons (silicified clay accumulation), calcic horizons (translocated calcium carbonate), and/or petrocalcic horizons (cemented calcium carbonate) which are related to the age of the soil. The topography of this landform ranges from nearly level to steep.

The fan terraces have been dissected or down cut to the point where flooding is none to rare. Peterson refers to this position as an erosional fan remnant. He mentions that this surface is "particularly significant for soil survey because of their different ages, slopes, and probably, soils." (39 pg 18).

Fan terraces have two important features. First is the area which is stable to medial stable to erosional forces. These areas usually occur on the summit of the terraces. Second is the side slope where erosional activity is cutting back in to the more stable summit. In these side slope areas the surface mantles are thin or eroded off. The thickness of the argillic horizons are thinner or the calcic horizons are higher in the soil profile due to this erosion. The thickness of the mollic epipedon varies in the survey due to the same erosional processes.

Soils on fan terraces vary greatly in make up. The Baboquivari series is a soil that can be found on the younger fan terraces. The Luckyhills, Stronghold, Forrest and Sutherland series are soils that can be found on the older fan terraces.

Hills and Mountains

This landform has no particular age connotation and therefore is not considered a geomorphic surface. (9) Soil development on this landform is highly dependent on the nature of the bedrock such as the chemical composition, grain size and hardness. The slope gradient of the bedrock and time are the most influential soil forming factors in determining soil development on hills and mountains.

Soils on this landform vary from soils with no development to soils with well developed argillic horizons. Soils that have little or no horizon development are usually found on the steeper slopes where erosional activity is greatest. Soils that have well developed horizons are generally located where there is slight to moderate erosional activity due to lower slope gradients.

For example, the Woodcutter series and the Budlamp series formed on granodiorite and granite. The Woodcutter soils formed on the lower slopes and somewhat more stable surfaces. This allowed residual weathering of the bedrock and permitted clay particles to orientate and coat sand grains and rock fragments which forms an argillic horizon. The Budlamp soils are usually on the steeper and more active erosional surfaces. This constant erosion of the soil does not allow time for clays to orientate to form an argillic horizon.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and other soils in other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns 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 similar inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

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

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Please note that textures used in the general map units are for the subsoil textures of that series and not the surface texture.

General Soil Map Unit Assoiciations*

1. Baboquivari - Combate - Riverwash

Very deep, well drained, nearly level, moderately fine and moderately coarse textured soils and riverwash; on fan terraces, alluvial fans, and in drainages

Slope: 0 to 3 percent
Elevation: 4000 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

This unit makes up 5 percent of the survey area.
- 39 percent Baboquivari and similar soils
- 28 percent Combate soils
- 16 percent Riverwash
- 17 percent minor soils

Baboquivari and similar soils
- landform: fan terraces
- depth class: very deep
- drainage: well
- parent material: mixed fan alluvium
- textural class: moderately fine
- hazard of flooding: none

Combate soils
- landform: alluvial fans
- depth class: very deep
- drainage: well
- parent material: fan alluvium from granite and gneiss
- textural class: moderately coarse
- hazard of flooding: none to rare

Riverwash

Riverwash consists of very deep, excessively drained, stratified sands, gravel, cobble, and stones from numerous sources. The materials are in the drainages of this unit. These materials are subject to common flooding and shifting.

Minor soils
- Bonita - fine textured soils on flood plains
- Bodecker - very gravelly coarse textured soils on flood plains

Major uses: livestock grazing and wildlife habitat

Management factors
- Baboquivari and similar soils - droughtiness, hazard of seepage and wind erosion
- Combate soils - droughtiness, hazard of seepage and wind erosion, fast intake rate

2. Luckyhills - McNeal

Very deep, well drained, nearly level to strongly sloping, gravelly moderately coarse and moderately fine textured soils; on fan terraces

Slope: 0 to 15 percent

Elevation: 4000 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

This unit makes up 27 percent of the survey area.
51 percent Luckyhills soils
34 percent McNeal soils
15 percent minor soils

Luckyhills soils
landform: fan terraces
depth class: very deep
drainage: well
parent material: mixed calcareous fan alluvium
textural class: gravelly moderately coarse

McNeal soils
landform: fan terraces
depth class: very deep
drainage: well
parent material: mixed fan alluvium
textural class: moderately fine

Minor soils
Bonita - fine textured soils on flood plains
Combate - moderately coarse textured soils on alluvial fans
Tombstone - very gravelly coarse textured soils on fan terraces

Major uses: livestock grazing and wildlife habitat

Management factors: droughtiness, hazard of wind erosion, gravelly surface, slope

3. Sutherland - Tombstone

Very shallow and shallow and very deep, well drained and somewhat excessively drained, gently to strongly sloping, very gravelly moderately coarse and very gravelly moderately coarse over very gravelly coarse textured soils; on fan terraces

Slope: 3 to 15 percent
Elevation: 4000 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

This unit makes up 18 percent of the survey area.
48 percent Sutherland and similar soils
42 percent Tombstone and similar soils
10 percent minor soils

Sutherland and similar soils
landform: fan terraces
depth class: very shallow and shallow
drainage: well
parent material: mixed calcareous fan alluvium
textural class: very gravelly moderately coarse

Tombstone and similar soils
landform: fan terraces
depth class: very deep
drainage: somewhat excessively
parent material: mixed calcareous fan alluvium
textural class: very gravelly moderately coarse over very gravelly coarse

Minor soils

Mule - very gravelly moderately coarse textured carbonatic soils shallow to a hardpan on fan terraces
Bonita - fine textured soils on flood plains

Major uses: livestock grazing and wildlife habitat

Management factors
Sutherland and similar soils - droughtiness, slope, depth to hardpan
Tombstone and similar soils - droughtiness, slope, very gravelly and cobbly surface

4. Stronghold - Elgin - McAllister

Very deep, well drained, gently sloping to moderately steep, gravelly moderately coarse, fine, and gravelly moderately fine textured soils; on fan terraces

Slope: 3 to 30 percent
Elevation: 4500 to 5200 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

This unit makes up 28 percent of the survey area.
36 percent Stronghold soils
28 percent Elgin and similar soils
17 percent McAllister soils
19 percent minor soils

Stronghold soils
landform: fan terraces
depth class: very deep
drainage: well
parent material: mixed calcareous fan alluvium

textural class: gravelly moderately coarse

Elgin and similar soils
landform: fan terraces
depth class: very deep
drainage: well
parent material: mixed fan alluvium
textural class: fine

McAllister soils
landform: fan terraces
depth class: very deep
drainage: well
parent material: mixed fan alluvium
textural class: gravelly moderately fine

Minor soils
Blacktail soils - gravelly fine to fine textured soils on fan terraces

Major uses: livestock grazing and wildlife habitat

Management factors
Stronghold soils - slope, gravelly surface
Elgin and similar soils - moderate shrink-swell potential, slope, gravelly surface
McAllister soils - moderate shrink-swell potential, slope, gravelly surface

5. Graham - Mabray - Rock outcrop

Very shallow and shallow, well drained, gently sloping to steep, fine and very cobbly medium textured soils and rock outcrop; on hills

Slope: 3 to 45 percent
Elevation: 4100 to 5590 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

This unit makes up 21 percent of the survey area.
27 percent Graham and similar soils
24 percent Mabray soils
16 percent Rock outcrop
33 percent minor soils

Graham and similar soils
landform: hills
depth class: very shallow and shallow
drainage: well
parent material: slope alluvium and residuum from basalt
textural class: fine

Mabray soils
landform: hills
depth class: very shallow and shallow
drainage: well
parent material: slope alluvium and residuum from limestone
textural class: very cobbly medium

Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of tilted and folded formations of limestone, other sedimentary rock, basalt, gniess, granite, granodiorite, shale, and sandstone. Rock outcrop also includes areas where the soil thickness is less than four inches. The higher percentage of rock outcrop is in areas near the tops of hills.

Minor soils
Lampshire soils - very stony medium textured soils on hills
Grizzle soils - moderately deep, moderately fine textured soils on hills
Schiefflin soils - very stony to gravelly coarse textured soils on hills

Major uses: livestock grazing and wildlife habitat

Management factors: depth to bedrock, cobbly and stony surface texture, Graham has high shrink-swell potential

6. Woodcutter - Budlamp

Very shallow and shallow, well drained, moderately steep to very steep, very gravelly moderately fine and very gravelly moderately coarse textured soils; on hills and mountains

Slope: 15 to 60 percent
Elevation: 5000 to 6200 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 57 to 62 degrees F.
Frost-free period: 180 to 210 days

This unit makes up 1 percent of the survey area.
60 percent Woodcutter soils
24 percent Budlamp soils
16 percent minor soils

Woodcutter soils
landform: hills and mountains
depth class: very shallow and shallow
drainage: well

parent material: slope alluvium and residuum
from granite and quartz monozite
textural class: very gravelly moderately fine

Budlamp soils
landform: mountains
depth class: very shallow and shallow
drainage: well
parent material: slope alluvium from
granodiorite
textural class: very gravelly moderately coarse

Minor soils
Rock outcrop
Soils that have less than 15 percent slope or
more than 60 percent slope

Major uses: livestock grazing and wildlife habitat

Management factors: depth to bedrock, hazard of water erosion, slope

* Terms for texture refer to the dominant texture of the subsurface horizons, generally between about 10 and 40 inches.

Detailed Soil Map Units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Luckyhills loamy sand is a phase of the Luckyhills series.
Some map units are made up of two or more major soils. These map units are called soil complexes.

A soil complex consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas.
Luckyhills - McNeal complex, 3 to 8 percent slopes is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Description

1 Baboquivari - Combate complex, 0 to 3 percent slopes

Setting

Landform: Baboquivari - fan terraces, Combate - alluvial fans
Hazard of flooding: Baboquivari - none, Combate - none to rare
Slope range: Baboquivari - 1 to 3 percent, Combate - 0 to 2 percent
Elevation: 4000 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees
Frost-free period: 215 to 250 days

Composition

Baboquivari and similar soils: 50 percent
Combate and similar soils: 40 percent
Contrasting inclusions: 10 percent

Typical Profile

Baboquivari
0 to 1 inch - brown sandy loam
1 to 4 inches - brown loam
4 to 24 inches - reddish brown sandy clay loam
24 to 34 inches - brown sandy loam
34 to 43 inches - brown gravelly loamy sand
43 to 60 inches - brown coarse sandy loam

Combate
0 to 2 inches - brown loamy sand
2 to 26 inches - dark brown coarse sandy loam
26 to 32 inches - dark yellowish brown coarse sandy loam
32 to 60 inches - yellowish brown sandy loam

Soil Properties and Qualities

Baboquivari
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately slow
Available water capacity: low to moderate
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion
by water - slight
by wind - moderately high
Shrink-swell potential: moderate
Calcium carbonate equivalent: less than 15 percent in the lower part
Corrosivity: steel - moderate; concrete - low

Combate
Parent material: fan alluvium from granite and gneiss
Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Available water capacity: moderate
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion
by water - slight
by wind - high
Shrink-swell potential: low
Calcium carbonate equivalent: trace amounts below 20 inches
Corrosivity: steel - moderate; concrete - low

Inclusions

Contrasting inclusions
:Soils similar to Bonita that have more than 35 percent clay
:Soils that have sandy or gravelly sand textures

Similar inclusions
:Soils that are calcareous throughout
:Soils similar to Combate that have sandy clay loam textures at moderate depths
:Soils that have gravelly subsoils
:Soils that have light colored loamy sand to sand surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
Baboquivari - droughtiness, hazard of seepage, moderately slow intake rate, hazard of wind erosion
Combate - droughtiness, hazard of seepage, fast intake rate, hazard of wind erosion

Rangeland

Dominant vegetation on the Baboquivari soil
:in potential plant community - Arizona cottontop, black grama, sideoats grama, cane beardgrass, bush muhly, plains bristlegrass, range ratany, Rocky Mountain zinnia
:in present plant community - burroweed, snakeweed, mesquite, longleaf Mormon tea, fluffgrass, bush muhly, cane beardgrass, Arizona cottontop, yucca

Dominant vegetation on the Combate soil
:in potential plant community - Arizona cottontop, black grama, bush muhly, plains bristlegrass, Rothrock grama, mesquite, whitethorn, sideoats grama
:in present plant community - burroweed, mesquite, whitethorn, Rothrock grama, mesa threeawn, fluffgrass

General management considerations for Baboquivari soils
:Water intake rate is the limiting factor which makes this component of the unit less productive.

:This site should never be moldboard plowed as this will bring finer materials to the surface which will reduce water intake rate even more.
:In excellent condition this site should produce more forage than the Combate.

Suitable management practices for the Baboquivari soils
:Proper use, deferred grazing and planned grazing systems are important practices on this site.
:Range seeding and brush management are acceptable practices.

General management considerations for Combate soils
:If this site is abused it will deteriorate to burroweed and/or mesquite, with little organic matter in the surface to retain moisture in the profile. Once this happens it becomes extremely difficult to re-establish perennial grasses. For these reasons the site is quite fragile, demanding close attention to any form of domestic livestock grazing.

Suitable management practices for Combate soils
:Proper grazing use and deferred grazing are essential practices to maintain this site.
:Discing in mulch when seeding will help in the re-establishment of grass species.

Wildlife Habitat Suitability

Baboquivari
Domestic grasses and legumes: suited
Desertic herbaceous plants: well suited
Upland desertic shrubs: suited

Combate
Domestic grasses and legumes: suited
Desertic herbaceous plants: well suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Baboquivari and Combate - VIe nonirrigated

Range site
Baboquivari - Loamy Upland, 12 to 16 inch precipitation zone
Combate - Sandy Loam (Deep), 12 to 16 inch precipitation zone

2 Blacktail gravelly sandy loam, 8 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: 8 to 15 percent
Elevation: 5000 to 5400 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 57 to 62 degrees F.
Frost-free period: 180 to 210 days

Composition

Blacktail and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

Surface rock fragments: 30 to 40 percent gravel
0 to 1 inch - brown to dark brown gravelly sandy loam
1 to 16 inches - dark reddish brown gravelly clay and clay
16 to 34 inches - yellowish red gravelly sandy clay

loam
34 to 43 inches - light brown and brown gravelly sandy loam
43 to 60 inches - light brown gravelly loamy sand

Soil Properties and Qualities

Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: slow
Available water capacity: low to moderate
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
  by water - slight
  by wind - slight
Shrink-swell potential: high
Calcium carbonate equivalent: 5 to 15 percent below 20 inches
Corrosivity: steel - high; concrete - moderate

Inclusions

Contrasting inclusions
  :Soils that have less than 18 percent clay and are calcareous
  :Soils that have less than 18 percent clay
  :Soils similar to Woodcutter that are very shallow and shallow to bedrock

Similar inclusions
  :Soils similar to Blacktail that have a thicker sandy loam surface
  :Soils that have more that 15 percent calcium carbonate equivalent between 10 and 20 inches

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: shrink-swell potential, slope

Rangeland

Dominant vegetation
  :in potential plant community - plains lovegrass, Texas bluestem, sideoats grama, crinkleawn, yerbe-de-pasmo
  :in present plant community - curly mesquite, hairy grama, annual grasses, sideoats grama, sprucetop grama

General management considerations
  :Long term heavy use will result in the vegetation shifting from mid-grass community to a short grass community. This shift in species composition will be accompanied by a 50 percent decrease in forage production.
  :As this site deteriorates gully erosion can become a difficult problem to overcome.

Suitable management practices
  :Deferred grazing, proper grazing, and planned grazing systems are extremely important on this site.
  :Prescribed burning must be used with caution on this site as it could easily reduce plant cover enough to drastically increase soil erosion.

Wildlife Habitat Suitability

Domestic grasses and legumes: suited
Upland wild herbaceous plants: suited
Upland shrubs and vines: suited
Upland hardwood trees: well suited

Interpretive Groups

Land capability classification:
  Blacktail - VIs nonirrigated

Range site
  Blacktail - Loamy upland, 16 to 20 inch precipitation zone

3 Budlamp - Woodcutter complex, 30 to 60 percent slopes

Setting

Landform: mountains
Slope range: 30 to 60 percent
Elevation: 5300 to 6200 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 57 to 62 degrees F.
Frost-free period: 180 to 210 days

Composition

Budlamp and similar soils - rangeland: 40 percent
Budlamp and similar soils - woodland: 20 percent
Woodcutter and similar soils: 30 percent
Contrasting inclusions: 10 percent

Typical Profile

Budlamp

Surface rock fragments: 40 to 50 percent gravel and cobble
0 to 1 inch - brown to dark brown very gravelly sandy loam
1 to 7 inches - dark brown very gravelly sandy loam
7 inches - granodiorite

Woodcutter

Surface rock fragments: 40 to 50 percent gravel and cobble
0 to 2 inches - dark brown gravelly fine sandy loam
2 to 5 inches - dark reddish brown very gravelly sandy clay loam
5 to 14 inches - reddish brown very gravelly sandy clay loam
14 inches - granite

Soil Properties and Qualities

Budlamp

Parent material: slope alluvium from granodiorite
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low
Potential rooting depth: 6 to 15 inches
Runoff: very rapid
Hazard of erosion
  by water - severe
  by wind - very slight
Shrink-swell potential: low
Corrosivity: steel - high; concrete - moderate

Woodcutter

Parent material: slope alluvium and residuum from granite and quartz monozite
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately slow
Available water capacity: low
Potential rooting depth: 8 to 18 inches
Runoff: very rapid
Hazard of erosion
  by water - severe
  by wind - very slight
Shrink-swell potential: moderate
Corrosivity: steel - high; concrete - moderate

Inclusions

Contrasting inclusions
:Soils that are moderately deep to bedrock (20 to 40 inches)
:Soils that have textures coarser than sandy loam

Similar inclusions
:Soils that have more than 35 percent clay
:Soils similar to Woodcutter that have more than 15 percent tree canopy, which allow these sites to be Woodland sites. These occur on steep north facing exposures. Tree cover is mainly Arizona white oak and Emory oak with lesser amounts of alligator juniper and/or Mexican pinyon. Important shrubs associated with these woodland sites include: manzanita, sacahuista, Schott yucca, silktassel, wedgeleaf haplopappus and desert spoon. Herbaceous species include: bullgrass, Texas bluestem, plains lovegrass, prairie junegrass, sedge, pinyon rice grass, sideoats grama, green sprangletop, beggartickgrass, stolon daisy, herbaceous sage, bouvardia, New Mexico copperleaf and tickcover.

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: depth to bedrock, slope, hazard of water erosion

Rangeland

Dominant vegetation on the Budlamp soil
:in potential plant community - Texas bluestem, plains lovegrass, sideoats grama, beggartickgrass, sotol, Palmer agave, California bricklebush, coralbean, bullgrass, green sprangletop, sedges, prairie junegrass
:in present plant community - plains lovegrass, sideoats grama, Texas Bluestem, hairy grama, sprucetop grama, sideoats grama, sotol, oak, juniper, pinyon, coralbean

Dominant vegetation on the Woodcutter soil
:in potential plant community - bullgrass, Texas bluestem, plains lovegrass, sideoats grama, beggertickgrass
:in present plant community - hairy grama, cane beardgrass, sprucetop grama, mesa threeawn, oak, bear grass, juniper, mesquite

General management considerations for Budlamp soils

:This site generally receives little grazing by domestic livestock due to steepness of slope and rough terrain.
:This site provides good habitat for many species of wildlife. In most situations wildlife should have major consideration in the design of any livestock utilization plans.

Suitable management practices for Budlamp soils
:Prescribed burning is available tool to maintain productivity of this site.
:When grazed by domestic livestock, trailing across steep slopes may be a problem.
:Overgrazing on small areas on this site may be difficult to avoid and should be considered in any management plan.

General management considerations for Woodcutter soils
:Steepness of slope and rough surface can impede livestock movement.
:Prescribed burning maybe viable tool on this site if brush becomes a problem.

Suitable management practices for Woodcutter soils
:This site will respond well to livestock management including planned grazing systems and proper grazing use.

Woodland

Dominant vegetation on the Budlamp soil
:in the potential plant community - Arizona white oak, Mexican blue oak, Emory oak, alligator juniper, Sonoran pinyon; with an understory of Texas blue stem, plains lovegrass, sideoats grama, bullgrass, sotol
:in present plant community - Arizona white oak, Mexican blue oak, Emory oak, alligator juniper, Mexican pinyon; with an understory of plains lovegrass, sideoats grama, Texas Bluestem, hairy grama, sprucetop grama, sideoats grama, sotol, oak, juniper, pinyon, coralbean

General management considerations for the Budlamp soils
:Management of natural and man caused wildfires
:Provide water for wildlife
:Erosion on steep slopes

Suitable management practices for the Budlamp soil
:Prescribed burning, shrub cutting for browse regeneration, water development will keep this site productive.

Wildlife Habitat Suitability

Budlamp and Woodcutter
Domestic grass and legumes: poorly suited
Upland wild herbaceous plants: suited
Upland shrubs and vines: poorly suited
Upland hardwood trees: poorly suited
Upland coniferous trees: poorly suited

Interpretive Groups

Land capability classification
Budlamp and Woodcutter - VIIe nonirrigated

Range site
Budlamp and Woodcutter - Shallow Hills, 16 to 20 inch precipitation zone

Woodland site
Budlamp soil (north aspect) - Shallow Hills, 16 to 20 inch precipitation zone

4 Chiricahua very gravelly clay loam, 8 to 15 percent slopes

Setting

Landform: hills
Slope range: 8 to 15 percent
Elevation: 4400 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Chiricahua and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

Surface rock fragments: 40 to 50 percent gravel and cobble
0 to 1 inch - reddish brown very gravelly clay loam
1 to 4 inches - reddish brown gravelly clay loam
4 to 9 inches - dark reddish brown gravelly clay

9 to 17 inches - dark red clay and gravelly clay
17 to 20 inches - weathered bedrock with clay films on the fractures
20 inches - quartzite

Soil Properties and Qualities

Parent material: residuum and slope alluvium from granite, granodiorite, gneiss and quartzite
Depth class: shallow
Drainage class: well
Permeability: slow
Available water capacity: low
Potential rooting depth: 10 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - very slight
Shrink-swell potential: moderate
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
  :Soils similar to Mabray that are high in calcium carbonate
  :Rock outcrop

Similar inclusions
  :Soils that average less than 35 percent clay

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, moderate shrink-swell potential, shallow to bedrock

Rangeland

Dominant vegetation
  :in potential plant community - hairy grama, sideoats grama, black grama, threeawn, plains bristlegrass, false mesquite, shrubby buckwheat, curly mesquite
  :in present plant community - hairy grama, curly mesquite, threeawn, sideoats grama, purple grama, mesquite, whitethorn, ocotillo, snakeweed, burroweed

General management considerations
  :This site has the potential to provide good forage; however slopes may impede livestock movement.

Suitable management practices
  :This site responds well to proper grazing use and planned grazing systems.

Wildlife Habitat Suitability

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
  Chiricahua - VIs nonirrigated

Range site
  Chiricahua - Shallow Upland, 12 to 16 inch precipitation zone

5 Combate loamy sand, 0 to 3 percent slopes

Setting

Landform: alluvial fans
Hazard to flooding: none to rare
Slope range: 0 to 3 percent
Elevation: 4000 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Combate and similar soils: 75 percent
Contrasting inclusions: 25 percent

Typical Profile

0 to 2 inches - brown loamy sand
2 to 8 inches - brown to dark brown sandy loam
8 to 26 inches - dark grayish brown sandy loam
26 to 32 inches - dark yellowish brown coarse sandy loam
32 to 60 inches - yellowish brown sandy loam

Soil Properties and Qualities

Parent material: fan alluvium from granite and gneiss
Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Available water capacity: moderate
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion
  by water - slight
  by wind - high
Shrink-swell potential: low
Calcium carbonate equivalent: trace amounts below 20 inches
Corrosivity: steel - moderate; concrete - low

Inclusions

Contrasting inclusions
  :Soils that are moderately deep to bedrock
  :Soils that have gravelly subsoils
  :Soils that are sandy throughout

Similar inclusions
  :Soils that effervesce to the surface
  :Soils with slopes greater than 3 percent
  :Combate soils with sandy loam textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, hazard of seepage, hazard of wind erosion

Rangeland

Dominant vegetation
  :in potential plant community - Arizona cottontop, black grama, bush muhly, plains bristlegrass, Rothrock grama, mesquite, whitethorn, sideoats grama
  :in present plant community - burroweed, mesquite, whitethorn, Rothrock grama, mesa threeawn, fluffgrass

General management considerations
  :If this site is abused it will deteriorate to burroweed and/or mesquite, with little organic matter in the surface to retain moisture in the profile. Once this happens it becomes extremely difficult to re-establish perennial grasses. For these reasons the site is quite fragile, demanding close attention to any form of domestic livestock grazing.

Suitable management practices
  :Proper grazing use and deferred grazing are essential practices to maintain this site.
  :Discing in mulch when seeding will help in the re-establishment of grass species.

Wildlife Habitat Suitability

  Domestic grasses and legumes: suited
  Desertic herbaceous plants: well suited
  Upland desertic shrubs: well suited

Interpretive Groups

Land capability classification
  Combate - VIe nonirrigated

Range site
Combate - Sandy Loam, (Deep), 12 to 16 inch precipitation zone

6 Elgin - Stronghold complex, 8 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: Elgin - 8 to 12 percent, Stronghold - 8 to 15 percent
Elevation: 4500 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Elgin and similar soils: 50 percent
Stronghold and similar soils: 40 percent
Contrasting inclusions: 10 percent

Typical Profile

Elgin
Surface rock fragments: 25 to 30 percent gravel
0 to 1 inch - dark brown very gravelly fine sandy loam

1 to 15 inches - dark reddish brown clay
15 to 21 inches - reddish brown gravelly sandy clay loam
21 to 27 inches - light reddish brown gravelly sandy loam
27 to 60 inches - pinkish gray very gravelly sandy loam

Stronghold
Surface rock fragments: 35 to 45 percent gravel
0 to 2 inches - dark brown very gravelly sandy loam
2 to 8 inches - brown gravelly sandy loam
8 to 18 inches - pinkish gray gravelly sandy loam
18 to 60 inches- pinkish gray gravelly sandy loam

Soil Properties and Qualities

Elgin
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: slow
Available water capacity: low
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
    by water - slight
    by wind - slight
Shrink-swell potential: moderate
Calcium carbonate equivalent: 10 to 25 percent below 20 inches
Corrosivity: steel - high; concrete - low

Stronghold
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Available water capacity: low
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
    by water - moderate
    by wind - slight
Shrink-swell potential: low
Corrosivity: steel - high; concrete - low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 14 to 40 percent below 2 inches

Inclusions

Contrasting inclusions
    :Soils that have more than 35 percent gravel
    :Soils similar to Combate in drainageways

Similar inclusions
    :Elgin soils with thicker sandy loam surface
    :Elgin soils that have less calcium carbonate
    :Soils similar to Bernardino that have a calcium carbonate accumulations above 20 inches

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
    Elgin - moderate shrink-swell potential, slope
    Stronghold - slope, gravelly surface

Rangeland

Dominant vegetation on the Elgin soil
    :in potential plant community - sideoats grama, cane beardgrass, plains lovegrass, prairie junegrass, green sprangletop, hairy grama, shrubby buckwheat, range ratany, false mesquite, plains bristlegrass, vine mesquite, curly mesquite
    :in present plant community - curly mesquite, black grama, hairy grama, vine mesquite, longleaf Mormon tea, burroweed, mesquite

Dominant vegetation on the Stronghold soil
    :in potential plant community - sideoats grama, black grama, blue threeawn, red threeawn, New Mexico feathergrass, false mesquite, longleaf Mormon tea, yucca
    :in present plant community - blue threeawn, red threeawn, black grama, cane beardgrass, false mesquite, Mormon tea, desert zinnia

General management considerations for Elgin soils
    :When abused this site can shift from a mid-grass, to a short grass plant community, resulting in much lower production.

Suitable management practices for Elgin soils
    :Proper grazing, deferred grazing, planned grazing systems and prescribed burning will keep this site productive.

General management considerations for Stronghold soils
    :This is a grassland site which is capable of producing a large volume of high quality feed.

Suitable management practices for Stronghold soils

:Proper grazing, deferred grazing, and planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Elgin and Stronghold

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretative Groups

Land capability classification
Elgin and Stronghold - VIs nonirrigated

Range site
Elgin - Loamy Upland, 12 to 16 inch precipitation zone
Stronghold - Limy Slopes, 12 to 16 inch precipitation zone

7 Epitaph very cobbly loam, 3 to 15 percent slopes

Setting

Landform: hills
Slope range: 3 to 15 percent
Elevation: 4700 to 4900 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Epitaph and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 40 to 50 percent gravel and cobble

0 to 1 inch	- dark brown very cobbly clay loam
1 to 6 inches	- dark reddish brown clay
6 to 27 inches	- dark reddish brown clay
27 to 38 inches	- indurated hardpan
38 inches	- basalt

Soils Properties and Qualities

Parent material: slope alluvium and residuum from basalt
Depth class: moderately deep
Drainage class: well
Permeability: slow
Available water capacity: low
Potential rooting depth: 20 to 40 inches
Runoff: medium to rapid
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: high
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Similar soils to Lampshire that have less than 18 percent clay
:Rock outcrop
:Soils similar to Graham that are shallow and do not have a hardpan

Similar inclusions
:Soils similar to Epitaph that have gravelly surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, high shrink-swell potential, depth to hardpan and bedrock

Rangeland

Dominant vegetation
:in potential plant community - sideoats grama, plains lovegrass, tobosa, vine mesquite, blue grama, curly mesquite, bush muhly, black grama, false mesquite, shrubby buckwheat, winterfat, prickly pear, staghorn cholla, soaptree yucca, canebeardgrass
:inpresentplantcommunity - tobosa, curly mesquite, sideoats grama, bush muhly, fluffgrass, cane beardgrass, mesquite, whitethorn, burroweed, wait-a-bit mimosa, cactus

General management considerations
:This site should be managed for sideoats grama, even though tobosa is the major constituent of the plant community.

:If this site becomes invaded by mesquite, it should only be grubbed as knifing will kill all the grass and the mesquite.

:When over used this site will develop bare areas which are difficult to re-established grass on due to the high shrink-swell potential of the soil.

Suitable management practices

:Proper grazing use, deferred grazing, planned grazing systems, brush management, range seeding, and water developments will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Epitaph - VIs nonirrigated

Range site
Epitaph - Clayey Upland, 12 to 16 inch precipitation zone

8 Forrest - Bonita complex, 0 to 3 percent slopes

Setting

Landform: Forrest - basin floor, Bonita - flood plain
Hazard of flooding: Forrest - none, Bonita - rare to occasional
Slope range: 0 to 3 percent
Elevation: 4500 to 4750 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Forrest and similar soils: 55 percent
Bonita and similar soils: 40 percent
Contrasting inclusions: 5 percent

Typical Profile

Forrest

0 to 1 inch - brown to dark brown fine sandy loam
1 to 7 inches - reddish brown sandy clay loam
7 to 22 inches - reddish brown clay
22 to 39 inches - yellowish red clay loam
39 to 60 inches - light reddish brown and reddish brown sandy clay loam

Bonita

0 to 2 inches - grayish brown silt loam
2 to 5 inches - dark grayish brown silty clay loam
5 to 20 inches - dark brown silty clay
20 to 40 inches - dark reddish gray clay
40 to 60 inches - reddish brown clay loam

Soil Properties and Qualities

Forrest

Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: slow
Available water capacity: moderate
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion
by water - slight
by wind - moderately high
Shrink-swell potential: high
Depth to calcic horizon: 20 to 40 inches
Calcium carbonate equivalent: 15 to 30 percent below 20 inches
Corrosivity: steel - high; concrete - low

Bonita

Parent material: mixed stream alluvium
Depth class: very deep
Drainage class: well
Permeability: slow
Available water capacity: high
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: high
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions

:Soils similar to Grizzle that have sandstone at moderate depths

:Soils that have less than 35 percent clay
:Soils similar to Combate that have less than 18 percent clay

Similar inclusions
:Soils similar to Forrest that have thicker sandy loam surfaces
:Soils similar to Bonita that have the buried soil at 15 to 20 inches

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
Forrest - high shrink-swell potential, hazard of wind erosion
Bonita - high shrink-swell potential, hazard of flooding

Rangeland

Dominant vegetation on the Forrest soil
:in potential plant community - blue grama, vine mesquite, sideoats grama, cane beardgrass, tobosa, giant sacaton, yucca
:in present plant community - blue grama, vine mesquite, Lehmann lovegrass, annual forbs, burroweed, broom snakeweed, yucca

Dominant vegetation on the Bonita soil
:in potential plant community - tobosa, sideoats grama, cane beardgrass, blue grama, red threeawn, curly mesquite, soaptree yucca, mesquite, white thorn, broom snakeweed
:in present plant community - tobosa, sideoats grama, mesquite, yucca, cholla

General management considerations for Forrest soil
:This site provides good livestock forage for year round use.
:Over use will result in the loss of diversity in the plant community.
:Consistent heavy utilization and lack of deferment will rapidly reduce the site to blue grama and mesquite. As further abuse occurs bare areas and square banked gullies will become prevalent.

Suitable management practices for the Forrest soil
:Deferred grazing, proper grazing use, and planned grazing systems will keep this site productive.

General management considerations for the Bonita soil
:Management should be based on sideoats grama production.
:If management is based on tobosa only, the sideoats grama disappears for the plant community. As retrogression occurs the site becomes dominated by tobosa followed by expanding bare areas. Once bare areas occur establishing perennial grasses is difficult because of the heavy soil surface textures.
:Mesquite invasion can become a problem on this site.

Suitable management practices on the Bonita soil
:Proper grazing use, planned grazing systems, deferred grazing and prescribed burning will keep this site productive.

Wildlife Habitat Suitability

Forrest
Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Bonita
Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited
Riparian herbaceous plants: suited
Riparian shrubs, vines and trees: suited

Interpretive Groups

Land capability classification
Forrest - VIe nonirrigated
Bonita - VIw nonirrigated

Range site
Forrest - Loamy Bottom, (Swales), 12 to 16 inch precipitation zone
Bonita - Clayey Bottom, 12 to 16 inch precipitation zone

9 Graham cobbly clay loam, 8 to 15 percent slopes

Setting

Landform: hills
Slope range: 8 to 15 percent
Elevation: 4500 to 5590 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Graham and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 45 to 55 percent gravel, cobble and stones
0 to 1 inch - reddish brown cobbly clay loam
1 to 12 inches - reddish brown clay
12 inches - basalt

Soils Properties and Qualities

Parent material: slope alluvium and residuum from basalt
Depth class: very shallow and shallow
Drainage class: well
Permeability: slow
Available water capacity: very low
Potential rooting depth: 8 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - slight
Shrink-swell potential: high
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
  :Soils similar to Lampshire that have less than 18 percent clay and more than 35 percent rock fragments
  :Rock outcrop
  :Soils similar to Epitaph that are moderately deep

Similar inclusions
  :Soils similar to Graham that have gravelly surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, high shrink-swell potential, depth to bedrock

Rangeland

Dominant vegetation
  :in potential plant community - sideoats grama, cane beardgrass, tobosa, plains lovegrass, black grama, curly mesquite, fourwing saltbush, false mesquite
  :in present plant community - curly mesquite, threeawn, hairy grama, tobosa, cane beardgrass, snakeweed, mesquite, yerbe-de-pasmo

General management considerations
  :This site produces a good volume of palatable forage.
  :If mesquite control is needed it should not be knifed, as this practice would be too hard on the grass species.
  :Excessive use will produce bare areas that can be very difficult for the re-establishment of grass.

Suitable management practices
  :Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
  Graham - VIs nonirrigated

Range site
  Graham - Clayey Upland, 12 to 16 inch precipitation zone

10 Graham - Lampshire complex, 15 to 30 percent slopes

Setting

Landform: hills
Slope range: Graham - 15 to 30 percent, Lampshire - 20 to 30 percent
Elevation: 4500 to 5590 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Graham and similar soils: 60 percent
Lampshire and similar soils: 25 percent
Contrasting inclusions: 15 percent

Typical Profile

Graham
Surface rock fragments: 45 to 55 percent gravel, cobble and stones
0 to 1 inch - brown to dark very cobbly loam
1 to 10 inches - reddish brown clay
10 inches - basalt

Lampshire
Surface rock fragments: 45 to 55 percent gravel, cobble and stones
0 to 5 inches - brown to dark brown very stony loam
5 inches - basalt

Soil Properties and Qualities

Graham
Parent material: slope alluvium and residuum from basalt
Depth class: very shallow and shallow
Drainage class: well
Permeability: slow
Available water capacity: very low
Potential rooting depth: 8 to 15 inches
Runoff: very rapid
Hazard of erosion
  by water - moderate
  by wind - very slight
Shrink-swell potential: high
Corrosivity: steel - high; concrete - low

Lampshire
Parent material: slope alluvium and residuum from igneous rock
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 12 inches
Runoff: very rapid
Hazard of erosion
  by water - moderate
  by wind - very slight
Shrink-swell potential: low
Corrosivity: steel - moderate; concrete - low

Inclusions

Contrasting inclusions
  :Rock outcrop
  :Soils with less than 35 percent clay

Similar inclusions
  :Graham soils with thicker sandy loam surfaces
  :Lampshire soils that effervesce in lower part of soil and on the bedrock

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
  Graham - high shrink-swell potential, slope, depth to bedrock
  Lampshire - slope, depth to bedrock, stony surface

Rangeland

Dominant vegetation on the Graham soil
  :in potential plant community - sideoats grama, cane beardgrass, tobosa, plains lovegrass, black grama, curly mesquite, fourwing saltbush, false mesquite, threeawn
  :in present plant community - curly mesquite, threeawn, hairy grama, tobosa, cane beardgrass, snakeweed, mesquite, yerbe-de-pasmo

Dominant vegetation on the Lampshire soil
  :in potential plant community - hairy grama, sideoats grama, black grama, cane beardgrass, threeawn, plains lovegrass, bullgrass, plains bristlegrass, wooly bunchgrass, Arizona cottontop, false mesquite, shrubby buckwheat, range ratany

:in present plant community - curly mesquite, hairy grama, cane beardgrass, threeawn, false mesquite, range ratany, mesquite, snakeweed

General management considerations for the Graham soil

:This site produces a good volume of palatable forage.

:If mesquite control is needed it should not be knifed, as this practice would be too hard on the grass species.

:Excessive use will produce bare areas that can be very difficult for the re-establishment of grass.

Suitable management practices for the Graham soil

:Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

General management considerations for the Lampshire soil

:This site is capable of producing wider diversity of palatable forage, however, steepness of slope and rough surface may limit livestock movement.

:This is an important wildlife site and should not have brush removed.

Suitable management practices for the Lampshire soil

:Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Graham and Lampshire

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Graham and Lampshire - VIs nonirrigated

Range site
Graham - Basalt Hills, 12 to 16 inch precipitation zone
Lampshire - Granitic Hills, 12 to 16 inch precipitation zone

11 Grizzle coarse sandy loam, 3 to 8 percent slopes

Setting

Landform: hills
Slope range: 3 to 8 percent
Elevation: 4500 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Grizzle and similar soils: 80 percent
Contrasting inclusions: 20 percent

Typical Profile

0 to 1 inch - reddish brown coarse sandy loam
1 to 6 inches - reddish brown clay loam
6 to 14 inches - reddish brown loam
14 to 32 inches - reddish brown loam
32 to 50 inches - weathered sandstone
50 inches - sandstone

Soil Properties and Qualities

Parent material: slope alluvium and residuum from sandstone and shale
Depth class: moderately deep
Depth to unweathered bedrock: 25 to 60 inches
Drainage class: well
Permeability: moderately slow
Available water capacity: low
Potential rooting depth: 25 to 60 inches
Runoff: medium to rapid
Hazard of erosion
by water - slight
by wind - moderately high
Shrink-swell potential: moderate
Calcium carbonate: 15 to 30 percent
Depth to calcic horizon: 1 to 10 inches
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils that are shallow to bedrock
:Rock outcrop
:Deep loamy soils along drainageways

Similar inclusions
- :Grizzle soils that have very gravelly surface textures
- :Grizzle soils that are moderately deep to unweathered bedrock

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, hazard of wind erosion

Rangeland

Dominant vegetation
- :in potential plant community - bush muhly, black grama, plains bristlegrass, fluffgrass, spike dropseed, creosotebush, whitethorn, tarbush, desert zinnia, knife-leaf condalia, Texas dogweed
- :in present plant community - blue threeawn, sand dropseed, fluffgrass, bush muhly, creosotebush, whitethorn, tarbush, desert zinnia, black grama, Texas dogweed, knife-leaf condalia

General management considerations
- :When this site is in good condition, it provides good winter browse for livestock and wildlife.

Suitable management practices
- :Proper grazing use, planned grazing system and deferred grazing are important practices on this site.

Wildlife Habitat Suitability

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretative Groups

Land capability classification
Grizzle - VIe nonirrigated

Range site
Grizzle - Limy Upland, 12 to 16 inch precipitation zone

12 Lampshire - Rock outcrop complex, 3 to 15 percent slopes

Setting

Landform: hills
Slope range: 3 to 15 percent
Elevation: 4100 to 5200 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Lampshire and similar soils: 60 percent
Rock outcrop: 20 percent
Contrasting inclusions: 20 percent

Typical Profile

Surface rock fragments: 45 to 55 percent gravel and cobble
0 to 2 inches - dark grayish brown very cobbly loam
2 to 15 inches - dark brown very cobbly loam
15 inches - rhyolite

Soil Properties and Qualities

Lampshire
Parent material: slope alluvium and residuum from igneous rock
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - very slight
Shrink-swell potential: low
Corrosivity: steel - moderate; concrete - low

Rock outcrop
Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles, and nearly vertical cliffs of andesite, basalt, rhyolite and other igneous rock. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
- :Soils similar to Graham that have more than 35 percent clay
- :Soils similar to Mabray that have high content of calcium carbonate and are closely associated with limestone
- :When closely associated with limestone, soils similar to Stronghold that are very deep

Similar inclusions
- :Soils that have slopes less than 3 percent or greater than 15 percent
- :Lampshire soils that effervesce in the lower part of the soil and on the bedrock
- :Soils that have stony surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, cobbly and stony surface

Rangeland

Dominant vegetation
- :in potential plant community - hairy grama, sideoats grama, black grama, cane beardgrass, threeawn, plains lovegrass, bullgrass, plains bristlegrass, wooly bunchgrass, Arizona cottontop, false mesquite, shrubby buckwheat, range ratany
- :in present plant community - curly mesquite, hairy grama, cane beardgrass, threeawn, false mesquite, range ratany, mesquite, snakeweed

General management considerations
- :This site is capable of producing wider diversity of palatable forage, however, steepness of slope and rough surface may limit livestock movement.
- :This is an important wildlife site and should not have brush removed.

Suitable management practices
- :Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Lampshire - VIs nonirrigated

Range site
Lampshire - Shallow Upland, 12 to 16 inch precipitation zone

13 Lampshire - Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: hills
Slope range: 15 to 60 percent
Elevation: 4100 to 5800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Lampshire and similar soils: 45 percent
Rock outcrop: 35 percent
Contrasting inclusions: 20 percent

Typical Profile

Surface rock fragments: 45 to 55 percent gravel, cobble and stones
0 to 2 inches - dark grayish brown very cobbly loam
2 to 14 inches - dark brown very cobbly loam
14 inches - rhyolite

Soil Properties and Qualities

Lampshire
Parent material: slope alluvium and residuum from igneous rock
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 18 inches
Runoff: very rapid
Hazard of erosion
by water - severe

by wind - very slight
Shrink-swell potential: low
Corrosivity: steel - moderate; concrete - low

Rock outcrop
Rock outcrop consists of barren rock that occurs as ledges, massive boulder piles and nearly vertical cliffs of andesite, basalt, rhyolite and other igneous rock. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
:Soils similar to Graham that have more than 35 percent clay
:Soils similar to Mabray that have high content of calcium carbonate and are closely associated with limestone
:When closely associated with limestone, soils similar to Stronghold like soils that are very deep

Similar inclusions
:Soils that have slopes less than 15 percent
:Lampshire soils that effervesce in the lower part of the soil and on the bedrock
:Soils that have stony surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, hazard of water erosion, cobbly and stony surface

Rangeland

Dominant vegetation
:in potential plant community - hairy grama, sideoats grama, black grama, cane beardgrass, threeawn, plains lovegrass, bullgrass, plains bristlegrass, wooly bunchgrass, Arizona cottontop, false mesquite, shrubby buckwheat, range ratany
:in present plant community - curly mesquite, hairy grama, cane beardgrass, threeawn, false mesquite, range ratany, mesquite, snakeweed

General management considerations
:This site is capable of producing wider diversity of palatable forage, however, steepness of slope and rough surface may limit livestock movement.
:This is an important wildlife site and should not have brush removed.

Suitable management practices
:Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Lampshire - VIIe nonirrigated

Range site
Lampshire - Granitic Hills, 12 to 16 inch precipitation zone

14 Luckyhills loamy sand, 0 to 3 percent slopes

Setting

Landform: fan terraces
Slope range: 0 to 3 percent
Elevation: 4000 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Luckyhills and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 10 to 20 percent gravel
0 to 3 inches - brown loamy sand
3 to 26 inches - brown to dark brown sandy loam and fine sandy loam
26 to 34 inches - light brown gravelly sandy loam

34 to 60 inches - light brown silt loam

Soil Properties and Qualities

Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderate
Available water capacity: moderate
Potential rooting depth: 60 inches or more
Runoff: slow
Hazard of erosion
  by water - slight
  by wind - high
Shrink-swell potential: low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 5 to 20 percent below 2 inches
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
  :Soils similar to McNeal that have more than 18 percent clay
  :Soils that have very gravelly subsoils

Similar inclusions
  :Soils with slopes greater than 3 percent
  :Soils similar to Luckyhills with sandy loam textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, hazard of wind erosion

Rangeland

Dominant vegetation
  :in potential plant community - black grama, fluffgrass, bush muhly, ratear coldenia, javelina brush, mariola, desert zinnia, creosotebush, tarbush, whitethorn, slim tridens
  :in present plant community - creosotebush, tarbush, whitethorn, desert zinnia, fluffgrass, bush muhly

General management considerations
  :Erosion becomes a problem as this site deteriorates.

Suitable management practices
  :Proper grazing use, planned grazing systems and brush management.

Wildlife Habitat Suitability

  Domestic grasses and legumes: poorly suited
  Desertic Herbaceous Plants: poorly suited
  Upland Desertic Shrubs: suited

Interpretive Groups

Land capability classification
  Luckyhills - VIIe nonirrigated

Range site
  Luckyhills - Limy Upland, 12 to 16 inch precipitation zone

15 Luckyhills - McNeal complex, 3 to 8 percent slopes

Setting

Landform: fan terraces
Slope range: 3 to 8 percent
Elevation: 4500 to 4750 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Luckyhills and similar soils: 50 percent
McNeal and similar soils: 40 percent
Contrasting inclusions: 10 percent

Typical Profile

Luckyhills
Surface rock fragments: 45 to 55 percent gravel
0 to 2 inches - pale brown very gravelly sandy loam
2 to 13 inches - pale brown gravelly sandy loam
13 to 31 inches - pinkish white sandy loam
31 to 39 inches - light brown gravelly sandy loam
39 to 60 inches - light brown and pink gravelly loam

McNeal
Surface rock fragments: 45 to 55 percent gravel

0 to 1 inch - strong brown very gravelly sandy loam
1 to 13 inches - yellowish red clay loam
13 to 21 inches - light reddish brown clay loam
21 to 41 inches - light reddish brown sandy clay loam
41 to 60 inches - strong brown sandy loam

Soil Properties and Qualities

Luckyhills
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderate
Available water capacity: low to moderate
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
  by water - moderate
  by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 5 to 30 percent below 2 inches
Corrosivity: steel - high; concrete - low

McNeal
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately slow
Available water capacity: moderate to high
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
  by water - slight
  by wind - slight
Shrink-swell potential: moderate
Depth to calcic horizon: 5 to 20 inches
Calcium carbonate equivalent: 15 to 55 percent below 5 inches
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
  :Soils similar to Bonita that are in the drainageways and have more than 35 percent clay
  :Soils similar to Combate that are not calcareous

Similar inclusions
  :Soils similar to Luckyhills that have thicker very gravelly sandy loam surface textures
  :Soils similar to McNeal that have gravelly textures throughout
  :Soils similar to Luckyhills that have weakly cemented horizons
  :Soils similar to Tombstone that have more than 35 percent rock fragments

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: gravelly surface, slope

Rangeland

Dominant vegetation on the Luckyhills soil
  :in potential plant community - bush muhly, black grama, sand dropseed, slim tridens, ratear coldenia, mariola, creosotebush, desert zinnia, whitethorn
  :in present plant community - slim tridens, blue threeawn, whitethorn, mariola, ratear coldenia, desert zinnia, tarbush, javelina brush

Dominant vegetation on the McNeal soil
  :in potential plant community - bush muhly, black grama, plains bristlegrass, sideoats grama, blue threeawn, desert zinnia, creosotebush, whitethorn, tarbush, longleaf Mormon tea, range ratany, mariola
  :in present plant community - tarbush, whitethorn, creosotebush, javelina brush, littleleaf sumac, desert zinnia, bush muhly, black grama, plains bristlegrass, fluffgrass

General management considerations for the Luckyhills soil
  :This site will not respond well to brush management.
  :It will provide reasonable winter and spring forage for cattle.

Suitable management practices for the Luckyhills soil
  :Proper grazing use, deferred grazing, planned grazing systems will help keep this site productive.

General management considerations for the McNeal soil
  :This site will respond to knifing and range seeding.
  :Currently it is a brush site, but has the potential to be a grass site.

Suitable management practices for the McNeal soil :Brush management, range seeding, proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Luckyhills
Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

McNeal
Domestic grasses and legumes: suited
Desertic herbaceous plants: well suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Luckyhills and McNeal - VIIs nonirrigated

Range site
Luckyhills and McNeal - Limy Upland, 12 to 16 inch precipitation zone

16 Luckyhills - McNeal complex, 8 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: 8 to 15 percent
Elevation: 4500 to 4750 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Luckyhills and similar soils: 55 percent
McNeal and similar soils: 30 percent
Contrasting inclusions: 15 percent

Typical Profile

Luckyhills
Surface rock fragments: 45 to 55 percent gravel
0 to 8 inches - pale brown very gravelly sandy loam
8 to 13 inches - pale brown gravelly sandy loam
13 to 31 inches - pinkish gray brown sandy loam
31 to 39 inches - pinkish white gravelly sandy loam
39 to 60 inches - pinkish white gravelly loam

McNeal
Surface rock fragments: 45 to 55 percent gravel
0 to 2 inches - strong brown very gravelly sandy loam
2 to 13 inches - yellowish red clay loam
13 to 21 inches - light reddish brown clay loam
21 to 41 inches - light reddish brown sandy clay loam
41 to 60 inches - strong brown sandy loam

Soil Properties and Qualities

Luckyhills
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderate
Available water capacity: low to moderate
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - moderate
by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 5 to 25 percent below 2 inches
Corrosivity: steel - high; concrete - low

McNeal
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately slow
Available water capacity: moderate to high
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: moderate
Depth to calcic horizon: 5 to 20 inches
Calcium carbonate equivalent: 15 to 55 percent below 5 inches
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions

:Soils similar to Bonita that are in the drainageways and have more than 35 percent clay
:Soils similar to Combate that are not calcareous

Similar inclusions
:Soils similar to Luckyhills that have thicker very gravelly sandy loam surface textures
:Soils similar to McNeal that have gravelly textures throughout
:Soils similar to Luckyhills that have weakly cemented horizons
:Soils similar to Tombstone that have more than 35 percent rock fragments

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: gravelly surface, slope

Rangeland

Dominant vegetation on the Luckyhills soil
:in potential plant community - bush muhly, black grama, sand dropseed, slim tridens, ratear coldenia, mariola, creosotebush, desert zinnia, whitethorn
:in present plant community - slim tridens, blue threeawn, whitethorn, mariola, ratear coldenia, desert zinnia, tarbush, javelina brush

Dominant vegetation on the McNeal soil
:in potential plant community - bush muhly, black grama, plains bristlegrass, sideoats grama, blue threeawn, desert zinnia, creosotebush, whitethorn, tarbush, longleaf Mormon tea, range ratany, mariola
:in present plant community - tarbush, whitethorn, creosotebush, javelina brush, littleleaf sumac, desert zinnia, bush muhly, black grama, plains bristlegrass, fluffgrass

General management considerations for the Luckyhills soil
:This site will not respond well to brush management.
:It will provide reasonable winter and spring forage for cattle.

Suitable management practices for the Luckyhills soil
:Proper grazing use, deferred grazing, planned grazing systems will help keep this site productive.

General management considerations for the McNeal soil
:This site will respond to knifing and range seeding.
:Currently it is a brush site, but has the potential to be a grass site.

Suitable management practices for the McNeal soil
:Brush management, range seeding, proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Luckyhills
Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

McNeal
Domestic grasses and legumes: suited
Desertic herbaceous plants: well suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Luckyhills and McNeal - VIIs nonirrigated

Range site
Luckyhills and McNeal - Limy Upland, 12 to 16 inch precipitation zone

17 Mabray - Chiricahua - Rock outcrop complex, 3 to 15 percent slopes

Setting

Landform: hills
Slope range: 3 to 15 percent
Elevation: 4100 to 5400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Mabray and similar soils: 45 percent
Chiricahua and similar soils: 30 percent
Rock outcrop: 15 percent
Contrasting inclusions: 10 percent

Typical Profile

Mabray

Surface rock fragments: 45 to 55 percent gravel and cobble

0 to 5 inches	- dark grayish brown very cobbly loam
5 to 11 inches	- dark grayish brown very cobbly loam
11 inches	- limestone

Chiricahua

Surface rock fragments: 40 to 55 percent gravel and cobble

0 to 1 inch	- reddish brown very gravelly clay loam
1 to 4 inches	- reddish brown gravelly clay loam
4 to 9 inches	- dark reddish brown gravelly clay
9 to 20 inches	- dark red clay and gravelly clay
20 inches	- quartzite

Soil Properties and Qualities

Mabray

Parent material: slope alluvium and residuum from limestone
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - very slight
Shrink-swell potential: low
Calcium carbonate equivalent: more than 40 percent
Corrosivity: steel - high concrete - low

Chiricahua

Parent material: slope alluvium and residuum from granite, gneiss, granodiorite and quartzite
Depth class: shallow
Drainage class: well
Permeability: slow
Available water capacity: low
Potential rooting depth: 10 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - very slight
Shrink-swell potential: moderate
Corrosivity: steel - high; concrete - low

Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of tilted and folded formations of limestone and metamorphic rock. Rock outcrop also includes areas where the depth to bedrock is less than 4 inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
  :Soils similar to Graham that have more than 35 percent clay
  :Soils similar to Lampshire that have no accumulations of calcium carbonate
  :Narrow bodies of soils similar to Combate and Bodecker that are adjacent to drainageways and very deep

Similar inclusions
  :Soils that have slopes less than 3 percent and more than 15 percent
  :Small areas with 50 to 60 percent cobble and 10 to 20 percent stones
  :Soils similar to Chiricahua that average less than 35 percent clay

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, cobbly and stony surface

Rangeland

Dominant vegetation on the Mabray soil
  :in potential plant community - sideoats grama, black grama, cane beardgrass, threeawn, slim tridens, plains bristlegrass, green sprangletop, bush muhly, Arizona cottontop, range ratany, mariola, sacahuista, ocotillo
  :in present plant community - black grama, bush muhly, sideoats grama, threeawn, plains bristlegrass, fluffgrass, sacahuista, ocotillo, whitethorn

Dominant vegetation on the Chiricahua soil

:in potential plant community - hairy grama, sideoats grama, cane beardgrass, slender grama, threeawn, plains lovegrass, plains bristlegrass, Arizona cottontop, false mesquite, curly mesquite, shrubby buckwheat

:in present plant community - curly mesquite, hairy grama, cane beardgrass, threeawn, mesquite, burroweed, sideoats grama

General management considerations for the Mabray soil

:Rough surface and steepness of slope greatly reduces livestock movement.

:Brush management and range seeding should not be considered on this site due to surface cobble and stones.

:This site generally remains in good to excellent condition.

Suitable management practices for the Mabray soil

:Proper grazing use and upland wildlife habitat management will keep this site productive.

General management considerations for the Chiricahua soil

:This site is limited by rooting depth for plants.

:Mechanical brush management is not a suitable practice on this site and range seeding is seldom effective.

Suitable management practices for the Chiricahua soil

:Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Mabray

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Chiricuhua

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Mabray - VIIs nonirrigated
Chiricahua - VIs nonirrigated

Range site
Mabray - Limestone Hills, 12 to 16 inch precipitation zone
Chiricahua - Shallow Upland, 12 to 16 inch precipitation zone

18 Mabray - Chiricahua - Rock outcrop complex, 15 to 30 percent slopes

Setting

Landform: hills
Slope range: 15 to 30 percent
Elevation: 4100 to 5400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Mabray and similar soils: 40 percent
Chiricahua and similar soils: 25 percent
Rock outcrop: 25 percent
Contrasting inclusions: 10 percent

Typical Profile

Mabray

Surface rock fragments: 45 to 55 percent gravel and cobble

0 to 5 inches	- dark grayish brown very cobbly loam
5 to 11 inches	- dark grayish brown very cobbly loam
11 inches	- limestone

Chiricahua

Surface rock fragments: 45 to 55 percent gravel and cobble

0 to 1 inch	- reddish brown very gravelly clay loam
1 to 4 inches	- reddish brown gravelly clay loam
4 to 9 inches	- dark reddish brown gravelly clay
9 to 20 inches	- dark red clay and gravelly clay
20 inches	- quartzite

Soil Properties and Qualities

Mabray

Parent material: slope alluvium and residuum from limestone
Depth class: very shallow and shallow
Drainage class: well

Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 20 inches
Runoff: very rapid
Hazard of erosion
by water - moderate
by wind - very slight
Shrink-swell potential: low
Calcium carbonate equivalent: more than 40 percent
Corrosivity: steel - high; concrete - low

Chiricahua
Parent material: slope alluvium and residuum from granite, gneiss, granodorite, and quartzite
Depth class: shallow
Drainage class: well
Permeability: slow
Available water capacity: low
Potential rooting depth: 10 to 20 inches
Runoff: very rapid
Hazard of erosion
by water - moderate
by wind - very slight
Shrink-swell potential: moderate
Corrosivity: steel - high; concrete - low

Rock outcrop
Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of tilted and folded formations of limestone and other metamorphic rock. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
:Soils similar to Graham that have more than 35 percent clay
:Soils similar to Lampshire that have no accumulations of calcium carbonate

Similar inclusions
:Soils that have slopes less than 15 percent and more than 30 percent
:Small areas with 50 to 60 percent cobble and 10 to 20 percent stones
:Soils similar to Chiricahua that average less than 35 percent clay

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, gravelly and cobbly surface

Rangeland

Dominant vegetation on the Mabray soil
:in potential plant community - sideoats grama, black grama, cane beardgrass, threeawn, slim tridens, plains bristlegrass, green sprangletop, bush muhly, Arizona cottontop, range ratany, mariola, sacahuista, ocotillo
:in present plant community - black grama, bush muhly, sideoats grama, threeawn, plains bristlegrass, fluffgrass, sacahuista, ocotillo, whitethorn

Dominant vegetation on the Chiricahua soil
:in potential plant community - hairy grama, sideoats grama, cane beardgrass, slender grama, threeawn, plains lovegrass, plains bristlegrass, Arizona cottontop, false mesquite, curly mesquite, shrubby buckwheat
:in present plant community - curly mesquite, hairy grama, cane beardgrass, threeawn, mesquite, burroweed, sideoats grama

General management considerations for the Mabray soil
:Rough surface and steepness of slope greatly reduces livestock movement.
:Brush management and range seeding should not be considered on this site due to surface cobble and stones.
:This site generally remains in good to excellent condition.

Suitable management practices for the Mabray soil
:Proper grazing use and upland wildlife habitat management will keep this site productive.

General management considerations for the Chiricahua soil
:This site is limited by rooting depth for plants. Mechanical brush management is not a suitable practice on this site and range seeding is seldom effective.

Suitable management practices for the Chiricahua soil
:Proper grazing use, deferred grazing, planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Mabray and Chiricahua

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
  Mabray - VIIs nonirrigated
  Chiricahua - VIe nonirrigated

Range site
  Mabray - Limestone Hills, 12 to 16 inch precipitation zone
  Chiricahua - Shallow Upland, 12 to 16 inch precipitation zone

19 Mabray - Rock outcrop complex, 3 to 15 percent slopes

Setting

Landform: hills
Slope range: 3 to 15 percent
Elevation: 4100 to 5200 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Mabray and similar soils: 60 percent
Rock outcrop: 30 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 50 to 60 percent gravel and cobble
0 to 8 inches - dark grayish brown extremely cobbly loam
8 to 11 inches - dark grayish brown very cobbly loam
11 inches - limestone

Soil Properties and Qualities

Mabray

Parent material: slope alluvium and residuum from limestone
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Available water capacity: very low
Potential rooting depth: 4 to 20 inches
Runoff: medium to rapid
Hazard of erosion
  by water - slight
  by wind - very slight
Shrink-swell potential: low
Calcium carbonate equivalent: more than 40 percent
Corrosivity: steel - high; concrete - low

Rock outcrop

Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of tilted and folded formations of limestone and other sedimentary rock. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
  :Soils similar to Graham that have more than 35 percent clay
  :Soils similar to Sutherland that have a hardpan

Similar inclusions
  :Soils that have slopes less than 3 percent and greater than 15 percent

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, cobbly surface

Rangeland

Dominant vegetation
  :in potential plant community - sideoats grama, black grama, cane beardgrass, threeawn, slim tridens, plains bristlegrass, green sprangletop, bush muhly, Arizona cottontop, range ratany, mariola, sacahuista, ocotillo
  :in present plant community - black grama, bush muhly, sideoats grama, threeawn, plains bristlegrass, fluffgrass, sacahuista, ocotillo, whitethorn

General management considerations
- :Rough surface and steepness of slope greatly reduces livestock movement.
- :Brush management and range seeding should not be considered on this site due to surface cobbles.
- :This site generally remains in good to excellent condition.

Suitable management practices
- :Proper grazing use and upland wildlife habitat management will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Mabray - VIIs nonirrigated

Range site
Mabray - Limestone Hills, 12 to 16 inch precipitation zone

20 Mabray - Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform: hills
Slope range: 15 to 45 percent
Elevation: 4100 to 5400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Mabray and similar soils: 50 percent
Rock outcrop: 40 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 50 to 60 percent gravel and cobble
0 to 5 inches - dark grayish brown extremely cobbly loam
5 to 11 inches - dark grayish brown very cobbly loam
11 inches - limestone

Soil Properties and Qualities

Mabray
Parent material: slope alluvium and residuum from limestone
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low
Potential rooting depth: 4 to 20 inches
Runoff: very rapid
Hazard of erosion
by water - moderate to severe
by wind - very slight
Shrink-swell potential: low
Calcium carbonate equivalent: more than 40 percent
Corrosivity: steel - high; concrete - low

Rock outcrop
Rock outcrop consists of barren rock that occurs as ledges and nearly vertical cliffs of tilted and folded formations of limestone and other sedimentary rock. Rock outcrop also includes areas where the depth to bedrock is less than four inches. The higher percentage of rock outcrop is in areas near the hilltops.

Inclusions

Contrasting inclusions
- :Soils similar to Graham and Chiricahua that have more than 35 percent clay

Similar inclusions
- :Soils that have slopes less than 15 percent and more than 45 percent
- :Small areas with 50 to 60 percent cobble and 10 to 20 percent stones

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock, hazard of water erosion, gravelly, cobbly and stony surface

Rangeland

Dominant vegetation
:in potential plant community - sideoats grama, black grama, cane beardgrass, threeawn, slim tridens, plains bristlegrass, green sprangletop, bush muhly, Arizona cottontop, range ratany, mariola, sacahuista, ocotillo
:in present plant community - black grama, bush muhly, sideoats grama, threeawn, plains bristlegrass, fluffgrass, sacahuista, ocotillo, whitethorn

General management considerations
:Rough surface and steepness of slope greatly reduces livestock movement.
:Brush management and range seeding should not be considered on this site due to surface cobbles.
:This site generally remains in good to excellent condition.

Suitable management practices
:Proper grazing use and upland wildlife habitat management will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Mabray - VIIe nonirrigated

Range site
Mabray - Limestone Hills, 12 to 16 inch precipitation zone

21 McAllister - Stronghold complex, 3 to 8 percent slopes

Setting

Landform: fan terraces
Slope range: 3 to 8 percent
Elevation: 4500 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

McAllister and similar soils: 50 percent
Stronghold and similar soils: 30 percent
Contrasting inclusions: 20 percent

Typical Profile

McAllister
Surface rock fragments: 35 to 45 percent gravel
0 to 2 inches - brown gravelly fine sandy loam
2 to 18 inches - reddish brown gravelly sandy clay loam
18 to 35 inches - yellowish red gravelly sandy clay loam
35 to 60 inches - light brown sandy loam

Stronghold
Surface rock fragments: 35 to 45 percent gravel
0 to 1 inch - dark brown very gravelly loamy sand
1 to 8 inches - dark brown gravelly sandy loam
8 to 25 inches - light brown gravelly sandy loam
25 to 60 inches - pink gravelly sandy loam

Soil Properties and Qualities

McAllister
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately slow
Available water capacity: moderate
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - moderate
by wind - slight
Shrink-swell potential: moderate
Depth to calcic horizon: 20 to 40 inches
Calcium carbonate equivalent: 15 to 30 percent below 20 inches
Corrosivity: steel - high; concrete - low

Stronghold
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low to low
Potential rooting depth: 60 inches or more
Runoff: medium

Hazard of erosion
  by water - slight
  by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 14 to 40 percent below 2 inches
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
  :Soils that have more than 35 percent gravel
  :Soils similar to Combate that are not calcareous

Similar inclusions
  :Soils similar to McAllister with thicker sandy loam surface textures
  :Soils similar to Baboquivari that do not have accumulations of calcium carbonate
  :Soils similar to Bernardino that have calcium carbonate accumulations less than 20 inches from the surface

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
  McAllister - moderate shrink-swell potential, slope, gravelly surface
  Stronghold - slope, gravelly surface

Rangeland

Dominant vegetation on the McAllister
  :in potential plant community - sideoats grama, plains lovegrass, cane beardgrass, black grama, blue grama, curly mesquite, false mesquite, shrubby buckwheat, longleaf Mormon tea
  :in present plant community - black grama, Lehmann lovegrass, fluffgrass, curly mesquite, false mesquite, whitethorn, longleaf Mormon tea

Dominant vegetation on the Stronghold soil
  :in potential plant community - sideoats grama, black grama, blue threeawn, red threeawn, New Mexico feathergrass, false mesquite, longleaf Mormon tea, yucca
  :in present plant community - blue threeawn, red threeawn, black grama, cane beardgrass, false mesquite, longleaf Mormon tea, desert zinnia

General management considerations for McAllister soils
  :When abused this site can shift from a mid-grass to a short grass plant community, resulting in much lower production.

Suitable management practices for McAllister soils
  :Proper grazing use, deferred grazing and planned grazing systems will keep this site productive.

General management considerations for Stronghold soils
  :This is a grassland site which is capable of producing a large volume of high quality feed.

Suitable management practices for Stronghold soils
  :Proper grazing use, deferred grazing and planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

McAllister
  Domestic grasses and legumes: suited
  Desertic herbaceous plants: suited
  Upland desertic shrubs: suited

Stronghold
  Domestic grasses and legumes: suited
  Desertic herbaceous plants: suited
  Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
  McAllister and Stronghold - VIs nonirrigated

Range site
  McAllister - Loamy Upland, 12 to 16 inch precipitation zone
  Stronghold - Limy Slopes, 12 to 16 inch precipitation zone

22 Pedregosa very gravelly fine sandy loam, 3 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: 3 to 15 percent

Elevation: 4000 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 60 to 67 degrees F.
Frost-free period: 180 to 230 days

Composition

Pedregosa and similar soils: 85 percent
Contrasting inclusions: 15 percent

Typical Profile

Surface rock fragments: 40 to 50 percent gravel and cobble
0 to 1 inches - brown very gravelly fine sandy loam
1 to 7 inches - brown very gravelly fine sandy loam
7 to 13 inches - fractured strongly cemented hardpan
13 to 60 inches - white and brown very gravelly sandy loam

Soil Properties and Qualities

Parent material: mixed calcareous fan alluvium
Depth class: very shallow or shallow to hardpan
Drainage class: well drained
Permeability: moderately rapid
Available water capacity: very low
Potential rooting depth: 5 to 20 inches
Runoff: medium or high
Hazard of erosion
  by water - slight
  by wind - slight
Shrink-swell potential: low
Content of rock fragments: more than 35 percent
Calcium carbonate equivalent: 5 to 25 percent
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
- :Soils similar to Bonita that are very deep and have more than 35 percent clay
- :Soils similar to Tombstone that have no hardpan
- :Soils similar to Graham that are very shallow and shallow to bedrock
- :Soils similar to Epitaph that are moderately deep to a hardpan and bedrock

Similar inclusions
- :Soils that have slopes greater than 15 percent
- :Blakeney soils which have less than percent rock fragments

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, depth to hardpan gravelly and cobbly surface,content of calcium carbonate

Rangeland

Dominant vegetation
- :in potential plant community - littleleaf sumac, whitethorn, creosotebush, mariola, desert zinnia, tarbush, javelina brush, range ratany, bush muhly, black grama, fluffgrass, sideoats grama, desert needlegrass, cane beardgrass, Arizona cottontop, blue threeawn, yucca
- :in present plant community - littleleaf sumac, creosotebush, whitethorn, javelina brush, mariola, desert zinnia, prickleaf dogweed, range ratany, yucca, fluffgrass, bush muhly, black grama, Lehmann lovegrass, blue threeawn

General management considerations
- :Fractured hardpan seems to be why littleleaf sumac is so prevalent on this site. By knifing this fractured hardpan, this site can undergo a change in plant communities. When the hardpan is destroyed by knifing this soil can be changed from a brush dominated plant community to a grass dominated community. This will change the range site from Limy Upland to Limy Slopes. Once converted to a Limy Slopes, this site can be maintained by prescribed burning.
- :Excavation can be difficult because of the restrictive hardpan.
- :This unit is slow to respond to all forms of management because of the high concentrations of calcium carbonate.

Suitable management practices
- :Brush management, proper grazing use, planned grazing systems and upland wildlife habitat management will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Monterosa - VIs nonirrigated
Ecological site: Limy Upland, 12 to 16 inch precipitation zone, 041XC309AZ
Major land resource area: 41 Southeastern Arizona Basin and Range
Land resource unit: 41-3AZ Southern Arizona Semidesert Grassland

23 Riverwash - Bodecker complex, 0 to 3 percent slopes

Setting

Landform: flood plains
Hazard to flooding: Riverwash - common, Bodecker - occasional
Slope range: Riverwash - 0 to 2 percent, Bodecker - 0 to 3 percent
Elevation: 4500 to 5200 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Riverwash and similar soils: 65 percent
Bodecker and similar soils: 30 percent
Contrasting inclusions: 5 percent

Typical Profile

Bodecker

0 to 3 inches	- brown loamy fine sand
3 to 12 inches	- brown gravelly sand
12 to 29 inches	- brown very gravelly coarse sand
29 to 48 inches	- brown gravelly sand
48 to 60 inches	- brown very gravelly coarse sand

Soil Properties and Qualities

Riverwash

Riverwash consists of very deep, excessively drained, stratified sands, gravel, cobble, and stones from numerous sources. The materials are in the drainages of this unit. These materials are subject to common flooding and shifting.

Bodecker

Parent material: mixed stream alluvium
Depth class: very deep
Drainage class: excessively
Permeability: very rapid
Available water capacity: very low
Potential rooting depth: 60 inches or more
Runoff: very slow
Hazard of erosion
by water - slight
by wind - high
Shrink-swell potential: low
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils similar to Combate that have sandy loam textures
:Soils similar to Stronghold or Luckyhills that are calcareous

Similar inclusions
:Soils similar to Bodecker that have thicker surface layers

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
Riverwash - flash flooding
Bodecker - flooding, fast intake, hazard of wind erosion

Rangeland

Dominant vegetation on the Bodecker soil
:in potential plant community - sideoats grama, Arizona cottontop, spike dropseed, green sprangletop, cane beardgrass, plains bristlegrass, bush muhly, mesquite, netleaf hackberry, desert willow, coyote willow, Arizona black walnut, burroweed
:in present plant community - bush muhly, fluffgrass, sand dropseed, spike dropseed, giant sacaton, mesquite, whitethorn, coyote willow, netleaf hackberry, Arizona black walnut

General management considerations for the Bodecker soil
:Livestock tend to concentrate on this site creating distribution problems.

:This site is a key wildlife area which grazing plans must consider.

Suitable management practices for the Bodecker soil
:Proper grazing use, deferred grazing, planned grazing systems, and wildlife habitat management will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited
Riparian herbaceous plants: suited
Riparian shrubs, vines and trees: suited

Interpretive Groups

Land capability classification
Bodecker - VIIw nonirrigated

Range site
Bodecker - Sandy Bottom, 12 to 16 inch precipitation zone

24 Schiefflin very stony loamy sand, 3 to 15 percent slopes

Setting

Landform: hills
Slope range: 3 to 15 percent
Elevation: 4000 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Schiefflin and similar soils: 80 percent
Contrasting inclusions: 20 percent

Typical Profile

Surface rock fragments: 30 to 40 percent stones, 5 to 10 percent boulders, and 5 to 10 percent gravel
0 to 6 inches - brown to dark brown very stony loamy sand
6 to 18 inches - brown to dark brown gravelly sand 18 inches - granodiorite

Soil Properties and Qualities

Parent material: slope alluvium and residuum from granodiorite
Depth class: very shallow and shallow
Drainage class: somewhat excessive
Permeability: rapid
Available water capacity: very low
Potential rooting depth: 5 to 20 inches
Runoff: medium to rapid
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: low
Stone class: 3
Corrosivity: steel - moderate; concrete - moderate

Inclusions

Contrasting inclusions
:Soils that are moderately deep or deep to bedrock
:Rock outcrop
:Soils similar to Combate that are very deep

Similar inclusions
:Soils with slopes greater than 15 percent
:Schiefflin soils with sandy loam textures
:Soils similar to Schiefflin that are adjacent to limestone that are calcareous

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, shallow to bedrock, surface boulders and stones

Rangeland

Dominant vegetation
:in potential plant community - sideoats grama, plains lovegrass, cane beardgrass, bull grass, black grama, bush muhly, Arizona cottontop, spice bush, littleleaf sumac, whitethorn, Palmer agave, range ratany, false mesquite, shrubby buckwheat
:in present plant community - black grama, bush muhly, sideoats grama, Arizona cottontop, cane beardgrass, bullgrass, mesa threeawn, littleleaf sumac, catclaw acacia, spice bush

General management considerations

:This site produces a large volume of palatable forage, however large stones and boulders restrict livestock movement.

:Stones and boulders on the surface increase effectiveness of the precipitation by concentrating moisture on the soil between the stones and boulders.

Suitable management practices

:Proper grazing use, deferred grazing, planned grazing systems, wildlife habitat management and water developments will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Schiefflin - VIIs nonirrigated

Range site
Schiefflin soil - Sandy Loam, (deep), 12 to 16 inch precipitation zone

25 Stronghold - Bernardino complex, 10 to 30 percent slopes

Setting

Landform: fan terraces
Slope range: 10 to 30 percent
Elevation: 4500 to 5200 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Stronghold and similar soils: 50 percent
Bernardino and similar soils: 40 percent
Contrasting inclusions: 10 percent

Typical Profile

Stronghold
Surface rock fragments: 45 to 55 percent gravel
0 to 2 inches - very dark gray very gravelly loam
2 to 8 inches - very dark gray very gravelly loam
8 to 20 inches - very dark grayish brown gravelly fine sandy loam
20 to 33 inches - light gray gravelly sandy loam
33 to 60 inches - grayish brown gravelly loamy sand

Bernardino
Surface rock fragments: 45 to 55 percent gravel
0 to 2 inches - dark grayish brown very gravelly fine sandy loam
2 to 7 inches - dark reddish brown clay loam
7 to 15 inches - reddish brown clay
15 to 18 inches - brown gravelly clay loam
18 to 48 inches - pinkish gray and light brown gravelly sandy loam
48 to 60 inches - pinkish white and light brown gravelly loamy sand

Soil Properties and Qualities

Stronghold
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low to low
Potential rooting depth: 60 inches or more
Runoff: medium to rapid
Hazard of erosion
  by water - slight to moderate
  by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 2 to 20 inches
Calcium carbonate equivalent: 14 to 30 percent below 2 inches
Corrosivity: steel - high, concrete - low

Bernardino
Parent material: mixed fan alluvium
Depth class: very deep
Drainage class: well
Permeability: slow
Available water capacity: low to moderate
Potential rooting depth: 60 inches or more
Runoff: medium to rapid
Hazard of erosion
  by water - moderate
  by wind - slight
Shrink-swell potential: moderate
Depth to calcic horizon: 5 to 20 inches
Calcium carbonate equivalent: 5 to 40 percent below 5 inches

Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils similar to Combate that are not calcareous and are in drainageways

Similar inclusions
:Soils with slopes less than 10 percent mainly on ridge crests
:Soils similar to Forrest and McAllister that have calcium carbonate accumulations below 20 inches

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
Stronghold - slope, gravelly surface
Bernardino - moderate shrink-swell potential, slope, gravelly surface

Rangeland

Dominant vegetation on the Stronghold soil
:in potential plant community - sideoats grama, black grama, blue threeawn, red threeawn, New Mexico feathergrass, false mesquite, longleaf Mormon tea, yucca
:in present plant community - blue threeawn, red threeawn, black grama, cane beardgrass, false mesquite, desert zinnia

Dominant vegetation on the Bernardino soil
:in potential plant community - sideoats grama, plains lovegrass, cane beardgrass, curly mesquite, hairy grama, false mesquite, shrubby buckwheat, longleaf Mormon tea, black grama
:in present plant community - curly mesquite, hairy grama, cane beardgrass, red threeawn, false mesquite, yucca, longleaf Mormon tea, yerba-de-pasmo

General management considerations for Stronghold soils
:This is a grassland site which is capable of producing a large volume of high quality feed.

Suitable management practice for the Stronghold soils
:Proper grazing use, deferred grazing and planed grazing systems are important practices on this site.

General management considerations for Bernardino soil
:When abused this site can shift from a mid-grasss to a short grass plant community resulting in lower production.

Suitable management practices for the Bernardino soil
:Proper grazing use, deferred grazing and planed grazing systems are important practices on this site.

Wildlife Habitat Suitability

Stronghold and Bernardino
Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Stronghold and Bernardino - VIs nonirrigated

Range site
Stronghold - Limy Slopes, 12 to 16 inch precipitation zone
Bernardino - Loamy Upland, 12 to 16 inch precipitation zone

26 Sutherland - Mule complex, 8 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: 8 to 15 percent
Elevation: 4200 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 210 to 250 days

Composition

Sutherland and similar soils: 55 percent
Mule and similar soils: 35 percent
Contrasting inclusions: 10 percent

Typical Profile

Sutherland
Surface rock fragments: 45 to 55 percent gravel and cobble
0 to 2 inches - brown very gravelly fine sandy loam
2 to 8 inches - brown very gravelly fine sandy loam
8 to 10 inches - fractured strongly cemented hardpan
10 to 60 inches - pink very gravelly fine sandy loam

Mule
Surface rock fragments: 45 to 55 percent gravel and cobble
0 to 2 inches - brown very gravelly fine sandy loam
2 to 10 inches - brown to dark brown very gravelly fine sandy loam
10 to 22 inches - light brown and pinkish white very gravelly loam
22 to 60 inches - light brown and pinkish white very gravelly loam

Soil Properties and Qualities

Sutherland
Parent material: mixed calcareous fan alluvium
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low
Potential rooting depth: 5 to 20 inches
Runoff: medium
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: low
Calcium carbonate equivalent: averages more than 40 percent
Corrosivity: steel - high; concrete - low

Mule
Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: well
Permeability: moderate
Available water capacity: low
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 2 to 10 inches
Calcium carbonate equivalent: averages more than 40 percent
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils with slopes more than 15 percent
:Soils similar to Mabray that are very shallow and shallow to bedrock

Similar inclusions

:Soils similar to Tombstone and Luckyhills that have less than 40 percent calcium carbonate

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors
Sutherland - droughtiness, slope, depth to hardpan
Mule - droughtiness, slope

Rangeland

Dominant vegetation on the Sutherland soil
:in potential plant community - sandpaper plant, whitethorn, littleleaf sumac, javelina brush, desert zinnia, tarbush, ratear coldenia, creosotebush, bush muhly, black grama, plains bristlegrass, desert needlegrass, mariola :in present plant community - sandpaper plant, whitethorn, desert zinnia, ratear coldenia,
sacahuista, javelina brush, spike dropseed, blue threeawn, slim tridens, black grama, plains bristlegrass, desert needlegrass

Dominant vegetation on the Mule soil
:in potential plant community - whitethorn tarbush, mariola, desert zinnia, sandpaper plant, black grama, bush muhly, slim tridens, desert needlegrass, sideoats grama, creosotebush, allthorn
:in present plant community - whitethorn, tarbush, desert zinnia, creosotebush, allthorn, sandpaper plant, mariola, black grama, bush muhly

General management considerations for the Sutherland soil
:This site is slow to respond to all forms of management.

:Brush management and range seeding are seldom economically feasible, because of poor soil chemistry and low available water capacity.
:Tarbush maybe present on this site because of cemented hardpan at depths less than 20 inches.
:Sandpaper plant is an important part of the plant community and tends to dominate this site when calcium carbonate equivalent is 40 to 60 percent.

Suitable management practices for the Sutherland soil
:Proper grazing use, deferred grazing, and planned grazing systems will keep this site productive.

General management considerations for the Mule soil
:This site is slow to respond to all forms of management.
:Brush management and range seeding are seldom economically feasible, because of poor soil chemistry and low available water capacity.
:Tarbush maybe present on this site because of increasing calcium carbonate with increasing depth.
:When calcium carbonate equivalent exceeds 60 percent, sandpaper plant tends to dominate this site and when calcium carbonate equivalent is 40 to 60 percent, sandpaper plant may or may not be present.

Suitable management practices for the Mule soil
:Proper grazing use, deferred grazing, and planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Sutherland and Mule
Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretative Groups

Land capability classification
Sutherland and Mule - VIIs nonirrigated

Range site
Sutherland and Mule - Limy Upland, 12 to 16 inch precipitation zone

27 Sutherland very gravelly fine sandy loam, 3 to 8 percent slopes

Setting

Landform: fan terraces
Slope range: 3 to 8 percent
Elevation: 4000 to 4800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Sutherland and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 35 to 45 percent gravel and cobble
0 to 1 inch - brown very gravelly fine sandy loam
1 to 18 inches - brown to light brown very gravelly fine sandy loam
18 to 42 inches - fractured strongly cemented hardpan
42 to 60 inches - pink very gravelly sandy loam

Soil Properties and Qualities

Parent material: mixed calcareous fan alluvium
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Available water capacity: very low
Potential rooting depth: 5 to 20 inches
Runoff: medium
Hazard of erosion
by water - slight
by wind - slight
Shrink-swell potential: low
Calcium carbonate equivalent: averages more than 40 percent
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils similar to Bonita that have more than 35 percent clay
:Soils similar to Tombstone that have no hardpan

Similar inclusions
:Soils with slopes greater than 8 percent
:Soils similar to Sutherland that have less than 15 percent gravel

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, slope, depth to hardpan

Rangeland

Dominant vegetation on the Sutherland soil
:in potential plant community - sandpaper plant, whitethorn, littleleaf sumac, javelina brush, desert zinnia, tarbush, ratear coldenia, creosotebush, bush muhly, black grama, plains bristlegrass, desert needlegrass, mariola
:in present plant community - sandpaper plant, whitethorn, desert zinnia, ratear coldenia, sacahuista, javelina brush, spike dropseed, blue threeawn, slim tridens, black grama, plains bristlegrass, desert needlegrass

General management considerations
:This site is slow to respond to all forms of management.
:Brush management and range seeding are seldom economically feasible, because of poor soil chemistry and low available water capacity.
:Tarbush maybe present on this site because of the cemented hardpan at depths less than 20 inches.
:Sandpaper plant is and important part of the plant community and tends to dominate this site when calcium carbonate equivalent is 40 to 60 percent.

Suitable management practices
:Proper grazing use, deferred grazing and planned grazing systems will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Sutherland - VIIs nonirrigated

Range site
Sutherland - Limy Upland, 12 to 16 inch precipitation zone

28 Tombstone very gravelly fine sandy loam, 8 to 15 percent slopes

Setting

Landform: fan terraces
Slope range: 8 to 15 percent
Elevation: 4200 to 5000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 67 degrees F.
Frost-free period: 215 to 250 days

Composition

Tombstone and similar soils: 90 percent
Contrasting inclusions: 10 percent

Typical Profile

Surface rock fragments: 50 to 65 percent gravel and cobble
0 to 1 inch - grayish brown very gravelly fine sandy loam
1 to 5 inches - dark grayish brown gravelly fine sandy loam
5 to 13 inches - pinkish white gravelly sandy loam
13 to 27 inches - pinkish gray very gravelly sandy loam
27 to 60 inches - pinkish gray very gravelly loamy sand

Soil Properties and Qualities

Parent material: mixed calcareous fan alluvium
Depth class: very deep
Drainage class: somewhat excessively
Permeability: moderately rapid
Available water capacity: very low to low
Potential rooting depth: 60 inches or more
Runoff: medium
Hazard of erosion
by water - slight

by wind - slight
Shrink-swell potential: low
Depth to calcic horizon: 1 to 20 inches
Calcium carbonate equivalent: averages 10 to 30 percent
Corrosivity: steel - high; concrete - low

Inclusions

Contrasting inclusions
:Soils that have slopes greater than 15 percent
:Soils similar to Bernardino that have more than 35 percent clay

Similar inclusions
:Soils similar to Luckyhills and Stronghold that have less than 35 percent gravel

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: droughtiness, slope, gravelly and cobbly surface

Rangeland

Dominant vegetation
:in potential plant community - littleleaf sumac, desert zinnia, sacahuista, mariola, whitethorn, Texas dogweed, black grama, bush muhly, desert needlegrass, slim tridens, sideoats grama
:in present plant community - littleleaf sumac, desert zinnia, Texas dogweed, sacahuista, whitethorn, mariola, blue threeawn, black grama, bush muhly, slim tridens, fluffgrass

General management considerations
:Available water capacity is the limiting factor on this site.
:In depleted conditions the site will respond well to mechanical or chemical brush management and range seeding.
:As grass stands mature, brush species will come back to dominate the site, however, under good management the grass species will persist and flourish with the brush.
:Brush will come back in about ten years after treatment. At this point prescribed burning is a viable tool to maintain proper species composition.

Suitable management practices
:Proper grazing use, planned grazing systems, brush management, range seeding and prescribed burning will keep this site productive.

Wildlife Habitat Suitability

Domestic grasses and legumes: suited
Desertic herbaceous plants: suited
Upland desertic shrubs: suited

Interpretive Groups

Land capability classification
Tombstone - VIIs nonirrigated

Range site
Tombstone - Limy Upland, 12 to 16 inch precipitation zone

29 Woodcutter gravelly sandy loam, 15 to 30 percent slopes

Setting

Landform: hills
Slope range: 15 to 30 percent
Elevation: 5000 to 5400 feet
Mean annual precipitation: 16 to 20 inches
Mean annual air temperature: 57 to 62 degrees F.
Frost-free period: 180 to 210 days

Composition

Woodcutter and similar soils: 80 percent
Contrasting inclusions: 20 percent

Typical Profile

Surface rock fragments: 30 to 45 percent gravel and cobble
0 to 1 inch - brown gravelly sandy loam
1 to 6 inches - dark reddish brown very gravelly loam
6 to 14 inches - dark reddish brown very gravelly sandy clay loam
14 inches - granite

Soil Properties and Qualities

Parent material: slope alluvium and residuum from granite and quartz monzonite
Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately slow
Available water capacity: low
Potential rooting depth: 5 to 20 inches
Runoff: very rapid
Hazard of erosion
  by water - moderate
  by wind - very slight
Shrink-swell potential: moderate
Corrosivity: steel - high; concrete - moderate

Inclusions

Contrasting inclusions
  :Rock outcrop
  :Soils that are in drainages and are moderately deep to deep
  :Soils similar to Budlamp that have less clay percentage

Similar inclusions
  :Soils that have slopes less than 15 percent
  :Woodcutter soils that have very gravelly surface textures

Use and Management

Major current uses: livestock grazing and wildlife habitat

Soil related factors: slope, depth to bedrock

Rangeland

Dominant vegetation
  :in potential plant community - bullgrass, Texas bluestem, plains lovegrass, sideoats grama, beggartickgrass, green sprangletop, sedges
  :in present plant community - hairy grama, cane beardgrass, sprucetop grama, mesa threeawn, oak, sacahuista, juniper, mesquite

General management considerations
  :Steepness of slope and rough surface can impede livestock movement.
  :Prescribed burning maybe viable tool on this site if brush becomes a problem.

Suitable management practices
  :This site will respond will to livestock management including planned grazing systems and proper grazing use.

Wildlife Habitat Suitability

Domestic grasses and legumes: poorly suited
Upland wild herbaceous plants: suited
Upland shrubs and vines: suited
Upland hardwood trees: suited

Interpretive Groups

Land capability classification
  Woodcutter - VIs nonirrigated

Range site
  Woodcutter - Shallow Hills, 16 to 20 inch precipitation zone

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 15. The capability classification of each map unit is given in the section "Detailed Soil Map Units".

Rangeland

written by Dan Robinett, Area Range Conservationist

General

About 31,000 acres (12,546 hectares) in the survey area is rangeland. The bulk of the soil survey area lies within Major Resource Area 41-3. This is the semidesert grassland with plant communities dominated by short and midgrasses of the genera boutelous, hilaria, aristida, and tridens. These grasslands evolved under natural fire regimes with fire free intervals ranging from 10 to 20 years. (8) Scattered across these grassland sites are a variety of both Sonoran and Chihuahuan desert shrubs and trees dominated by genera in the legume, composite and caltrop families. A small portion of the watershed, above 5,000 feet (1,525 m) elevation, is within Major Land Resource Area 41-1. This is Mexican oak-grassland savannah. Evergreen oak, juniper, and pinyon species form overstory canopies of 10 to 15 percent. Understories are dominated by warm season midgrasses of the genera bouteloua, muhlenbergia, eragrostis and andropogon.

The 41-3 resource area occurs in southern Arizona at elevations ranging from 3,200 to 5,300 feet (975 to 1,615 m) elevation. Mean annual rainfall ranges from 12 to 16 inches (305 to 406 mm). In this area about 70 percent of the total rainfall comes in July through September. The other 30 percent of the total is received in fall, winter, and early spring. Average frost free season ranges from 215 to 250 days. Mean monthly temperatures range from 45 to 50 degrees F. (7 to 10 degrees C.) in January to 90 to 100 degrees F. (32 to 38 degrees C.) in June. Mean annual rainfall on the watershed ranges from 11.7 inches (297 mm) near Fairbanks (3850 feet (1,173 m) elevation), and 14.0 inches (350 mm) at Tombstone 4610 feet (1,405 m) elevation), to 15.8 inches (401 mm) near the Sala Ranch in the Dragoon Mountains (5160 feet (1,573 m) elevation).

Historic Use

The soil survey area has a long history of grazing and as a result vegetative change has been dramatic in some areas. The first introductions of domestic livestock occurred in the 1690's along the San Pedro River adjacent to the watershed. Sobahipuri Indian settlements near Fairbanks at Quiburi and Santa Cruz de Gaypanipitea received cattle, horses, and sheep from the Jesuit Fr. Kino. These early introductions of livestock went wild due to frequent Apache raiding which by 1762 had emptied the San Pedro Valley of the Indian settlements. (8) These animals undoubtedly grazed the watershed area, at least intermittently. A period of Mexican settlement followed this era starting in 1820. Large ranches were formed in the river bottoms and land grants such as the Boquillas and Babocomari were made in 1826. (8, 27)

Apache raiding finally drove out these ranches and by 1846 the San Pedro Valley was again abandoned. Large herds of feral livestock remained and made seasonal use of the watershed's land. (27)

With the Gadsen Purchase in 1854 a third attempt at settlement and grazing industry started. The homesteads cane into the San Pedro Valley in 1867. The first rangeland was public domain and free for use by any one who could secure and control a source of water. The discovery of silver ore and almost overnight establishment of Tombstone in 1878 had a major impact on rangeland in the middle of the watershed. (8, 10) By 1901 Tombstone had shrivelled due to groundwater invasion of the mine shafts but for a period of nearly 20 years and with a peak population of 15,000 people the impact on the surrounding land was tremendous. Grazing, trampling, and wood gathering had virtually stripped the area. (8, 10) The period of 1880 to 1890 was one of rapid expansion of the livestock industry in the Arizona territory. Passage of the Texas Land Law in 1883 resulted in large cattle drives to the free ranges in Arizona. (48) Cattle numbers grew from about 35,000 in 1880 to nearly 1,500,000 by 1891 in the territory. By 1886 the Tombstone Stockgrower's warned of a crisis approaching due to overcrowding and overgrazing by livestock and vowed to fight any new incursions into their territory. (27)

It was estimated that 50 to 75 percent of the animals died in Southeast Arizona in the drought of 1891 to 1894. (27) The land was severely overgrazed and eroding and the stage was set for the transformation of the area's grasslands to shrublands. The grazing pressure was unrelenting until statehood. Adjudication of state land, secured from the public domain, began in 1916. State land was assigned by the commissioner to the owners of existing watering places, both as, area's natural tributary to those waters and in size commensurate with the amount of patented land the rancher held. (15) Ranch boundary fencing began in 1916 and was done in a few years. Grazing was no longer free and livestock numbers were brought under some control. While grazing pressure was reduced around historic watering areas, new water developments and the restriction of ranch fencing brought a continuous grazing pressure to the entire countryside. As perennial forage species were removed by continuous grazing over the years, the unpalatable shrubs were able to increase and fill the vacant spaces. Grazing capacities have continued to decline. Around Tombstone and closest to the San Pedro River, historically the heaviest used areas, the present range conditions are so poor that the land, in reality, has no carrying capacity. Grazing management has only been practiced for the last 8 to 10 years on the watershed. Today, three ranches, accounting for about 70 percent of the land area on Walnut Gulch Watershed, are implementing grazing schemes to graze and the rest areas to allow for recovery and reproduction of forage species.

Range Sites

A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity and proportion of species in the plant community. Soil reaction, salinity, and position are also important.

The range sites have been identified and potential plant communities described. In range survey, the existing plant communities are compared to the potential and range condition is scored based upon the departure from potential. Range site and condition inventory determines the status of the land at a particular time and helps the manager or rancher set reasonable objectives and chart realistic courses to achieve them.

Table 5 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 5 follows.

A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and calcium carbonate content are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation, (the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil), is listed by common name. Under composition, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Recreation

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6, the degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soil properties are generally favorable and that limitations are minor and easily overcome. Moderate means that limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and not subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depends largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In the "Detailed Map Units", the soils in the survey area are rated to reflect the soils suitability for maintenance, improvement or creation of specific wildlife habitat elements. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

Ratings are based on the existence of limitations in the soil, such as the available water capacity, content of rock fragments, depth to bedrock or hardpan, and soil reaction. The ratings are expressed as well suited, suited, and poorly suited. A rating of well suited indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of suited indicates that the element or kind of habitat can be established, improved, or maintained, in most places. Soil limitations are moderate. Moderately intensive management is required for satisfactory results. A rating of poorly suited indicates that limitations are severe for the designated element or kind of habitat. Soil limitations are severe. Habitats can be created, improved, or maintained in most places, but management is difficult and must be intensive.

The elements of wildlife habitat are described in the following paragraphs.

Domestic grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of domestic grasses and legumes are surface texture, content of rock fragments, available water capacity, depth to bedrock or hardpan, flood hazard, permeability, percent slope and erosional factors. Soil temperature and soil moisture are also considerations. Examples of domestic grasses and legumes are Lehmanns lovegrass, clovers, and alfalfa.

Desertic herbaceous plants are herbaceous plants that are adapted to growing in desert climates. Soil properties and features that affect the growth of desertic herbaceous plants are surface texture, available water capacity, soil reaction, and content of rock fragments. Soil temperature and soil moisture are also considerations. Examples of desertic herbaceous plants are threeawn species, grama species, bush muhly, curly mesquite, Arizona cottontop, coldenia, zinnia species, mariola, winterfat, false mesquite, and range ratany.

Upland desertic shrub consists of a diverse shrub community that is adapted to desert environment that is dryer than is common to moist riparian zones. Soil properties and features that affect the growth of upland desertic shrubs are surface texture, available water capacity, soil reaction, and content of rock fragments. Soil temperature and soil moisture are also considerations. Examples of upland desertic shrubs are whitethorn, mesquite, javelinabush, fourwing saltbush, littleleaf sumac, yucca, mimosa, Mormon tea, and shrubby buckwheat.

Riparian herbaceous plants are adapted to wetter soil conditions than is common in the dryer upland areas. Soil properties and features that affect the growth of riparian herbaceous plants are surface texture, flooding hazard and duration, and content of rock fragments. Soil temperature and soil moisture are also considerations. Examples of riparian herbaceous plants are wheatgrass, sacaton, tobosa, broom snakeweed, and sand dropseed.

Riparian shrubs, vines, and trees adapted to wetter soil conditions than is common in the dryer upland areas. Soil properties and features that affect the growth of riparian shrubs, vines, and trees are available water capacity, and flood hazard and duration. Soil temperature and soil moisture are also considerations. Examples of riparian shrubs, vines, and trees are slender janusa, Arizona walnut, mesquite, desert willow, coyote willow, graythorn, and netleaf hackberry.

Upland wild herbaceous plants are a diverse community of upland herbaceous plants that are adapted to the dryer soil conditions than is common in the moist riparian areas, but not as dry as in the upland desert areas. Soil properties and features than affect the growth of upland wild herbaceous plants are surface texture, available water capacity, and content of rock fragments. Soil temperature and soil moisture are also considerations. Examples of upland wild herbaceous plants are sedges, beggartickgrass, sacahuista, bullgrass, California bricklebush, and prairie junegrass.

Upland shrubs and vines are a diverse community of upland shrubs and vines that are adapted to the dryer soil conditions than is common in the moist riparian areas, but not as dry as in the upland desert areas. Soil properties and features than affect the growth of upland shrubs and vines are surface texture, available water capacity, depth to bed rock or hardpan, and the content of rock fragments. Soil temperature and soil moisture are also considerations. Examples of upland shrubs and vines are sotol, coralbean, manzanita, and agave species.

Upland hardwood tress commonly are found at the higher elevation which receive more precipitation. Soil properties and features that affect the growth of upland hardwood trees are available water capacity, and depth to bedrock or a hardpan. Soil temperature and soil moisture are also considerations. Examples of upland deciduous trees are white oak, Mexican blue oak, Emory oak, and mesquite.

Upland coniferous trees commonly are found at the higher elevation which receive more precipitation. In general, conifers often will grow in harsher soil conditions than is required for hardwoods. Soil properties and features that affect the growth of upland coniferous trees are available water capacity and depth to bedrock or hardpan. Soil temperature and soil moisture are also considerations. Examples of upland coniferous trees are juniper, Mexican pinyon, and Sonoran pinyon.

Vertebrate animals live throughout the survey area. Highly mobile species use all available spaces, while less mobile species are restricted to one or two habitat types. Examples of the mobile species are bats, birds, including doves, mule deer, whitetail deer, javelina, cottontail rabbits, jack rabbits, coyotes, gray fox, coatis, porcupines, bobcats, mountain lions, skunks, and raccoons. Some snakes, such as rattlesnakes, bullsnakes, coachwhips and king snakes, also have fairly wide range. Deer, javelina, and bobcats are restricted to areas of free water. Even though they have mobility, that action is controlled by the need for water. Animals that do not have mobility are rats and mice, gophers, lizards, skinks, toads, quail, most snakes, geckoes, and ground squirrels. These animals are usually nonspecific in the vegetation they eat, require no free water to survive, are mainly nocturnal, and are small. All of these are characteristics of animals that live in harsh, hot dry climates.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils, on the estimated data and test data.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the susceptibility of the soil to flooding.
The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. Flooding, shrink-swell potential, and organic layers can cause the movement of footings. Depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and frost action potential affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 10 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of good indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; fair indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and poor indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field or if slope is excessive. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill, trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or a cemented pan to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated good, fair, or poor as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones and slope. How well the soil performs in place after it has been compacted is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated good contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Soils rated fair are more than 35 percent silt and clay sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, rock fragments, bedrock, and toxic material.

Soils rated good have friable loamy material to a depth of at least 40 inches. They are free of stones and cobble, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer.

Soils rated fair are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent.

Soils rated poor are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, or have slopes of more than 15 percent.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect irrigation, terraces and diversions.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium.

Irrigation is the controlled application of water to support plant growth. The design and management of an irrigation system are affected by flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Engineering Index Properties

Table 7 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology".

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly". Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (4) and the system adopted by the American Association of State Highway and Transportation Officials (3).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; and silty and clayey soils as ML, CL, OL, MH, CH, and OH. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 8 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at

1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design septic tank absorption fields and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops.

They are very highly erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are moderately

high erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are moderately erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are very slightly erodible because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table J, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 9 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 9 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. None means that flooding is not probable; rare that it is unlikely but possible under unusual weather conditions; occasional that it occurs, on the average, once or less in 2 years; and frequent that it occurs, on the average, more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as low, moderate, or high, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (51). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 14 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Aridisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Argids (Arg, meaning presence of an argillic horizon, plus ids, from Aridisoils).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Paleargids (Pale, meaning old or excessively developed, plus argid, the suborder of the Aridisols that have an argillic horizon).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Ustollic Paleargids.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, thermic Ustollic Paleargids.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. An example is the Elgin series which is fine, mixed, thermic Ustollic Paleargids.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (51). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (57). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

Baboquivari Series

Depth class: very deep
Drainage class: well
Permeability: moderately slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 1 to 3 percent
Elevation: 4000 to 5000 feet
Classification: Fine-loamy, mixed, thermic Ustollic Haplargids

Typical Pedon

Baboquivari sandy loam in an area of Baboquivari - Combate complex, 0 to 3 percent slopes, located at a latitude of 31 degrees, 43 minutes, 30 seconds North and longitude of 110 degrees, 00 minutes, 55 seconds West; about 1800 feet south and 900 feet west of the northeast corner of section 5, Township 20 S., Range 23 E.

A--0 to 1 inch; brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/3) moist; moderate thin platy structure; loose, very friable, nonsticky and nonplastic; few fine roots; common very fine and fine tubular pores; 10 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt1--1 to 4 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; 10 percent gravel; common prominent clay films on ped faces and on sand and gravel; common prominent organic coatings on sand and gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

Bt2--4 to 24 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; common very fine and fine tubular pores; 10 percent gravel; common distinct clay films on gravel, ped faces, and lining pores; common distinct organic coatings on sand and gravel; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

C1--24 to 34 inches; brown (7.5YR 5/3) sandy loam, brown to dark brown (7.5YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; common fine interstitial and tubular pores; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

C2--34 to 43 inches; brown (7.5YR 5/4) gravelly loamy sand, dark brown (7.5YR 3/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; common fine interstitial pores; 18 percent gravel; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

C3--43 to 60 inches; brown (7.5YR 5/3) coarse sandy loam, brown to dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; common very fine and fine tubular pores; slightly effervescent; slightly alkaline (pH 7.8).

Range in Characteristics

Reaction: neutral to slightly alkaline
Clay content: 20 to 30 percent in the control section
Effervescence: none to slight
Organic matter: 1 to 2 percent
Some pedons have a buried Btk horizon

A horizon
    Hue: 10YR, 7.5YR
    Value: 4 or 5 dry, 3 or 4 moist
    Chroma: 2 through 4, dry or moist
    Texture: sandy loam, loamy sand, coarse sandy loam

Bt horizon
    Hue: 7.5YR, 5YR
    Value: 3 through 5 dry, 3 or 4 moist
    Chroma: 2 through 4, dry or moist
    Texture: loam, sandy clay loam
    Rock fragments: 5 to 15 percent

C horizon
    Hue: 7.5YR, 5YR
    Value: 5 or 6 dry, 3 or 4 moist
    Chroma: 3 or 4, dry or moist
    Texture: sandy loam, loamy sand, coarse sandy loam, loam
    Calcium carbonate equivalent: less than 15 percent
    Rock Fragments: 0 to 35 percent gravel

Bernardino Series

Depth class: very deep
Drainage class: well
Permeability: slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 10 to 30 percent
Elevation: 4500 to 5200 feet
Classification: Fine, mixed, thermic Ustollic Haplargids

Typical Pedon

Bernardino very gravelly fine sandy loam in an area of Stronghold - Bernardino complex, 10 to 30 percent slopes, located at a latitude of 31 degrees, 40 minutes, 56 seconds North and longitude of 109 degrees, 57 minutes, 25 seconds West; 1390 feet north and 710 feet east from the southwest corner of section 25, Township 19 S., Range 23 E.

A--0 to 2 inches; dark grayish brown (10YR 4/2) very gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; 49 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt--2 to 7 inches; dark reddish brown (5YR 3/2) clay loam, dark reddish brown (5YR 2.5/2) moist; moderate fine subangular blocky structure; soft, very friable, sticky and plastic; common very fine and fine roots; few fine tubular pores; many distinct clay films on rock fragments and on ped faces; 10 percent gravel; noneffervescent; neutral (pH 7.2); clear smooth boundary.

Btk1--7 to 15 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; soft, very friable, sticky and plastic; common very fine and fine roots and few medium roots; few fine tubular pores; many distinct clay films on gravel and on ped faces; 10 percent gravel; strongly effervescent; neutral (pH 6.8); abrupt smooth boundary.

Btk2--15 to 18 inches; brown (7.5YR 5/3) gravelly clay loam, brown to dark brown (7.5YR 4/3) moist; weak fine subangular blocky structure; soft, friable, sticky and plastic; common very fine and fine and few medium roots; few fine tubular pores; many distinct calcium carbonate coatings on gravel and on ped faces; 30 percent gravel; violently effervescent, 36 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); abrupt wavy boundary.

2Bk1--18 to 48 inches; 70 percent pinkish gray (7.5YR 7/2) and 30 percent light brown (7.5YR 6/3) gravelly sandy loam, brown (7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; common fine interstitial and tubular pores; many distinct calcium carbonate coatings on gravel; 30 percent gravel; violently effervescent, 32 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); clear wavy boundary.

2Bk2--48 to 60 inches; pinkish white (7.5YR 8/2) and light brown (7.5YR 6/3) gravelly loamy sand, pinkish gray (7.5YR 7/2) and brown (7.5YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few fine interstitial and tubular pores; many distinct calcium carbonate coatings on gravel; 33 percent gravel; violently effervescent, 10 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Surface rock fragments: 45 to 55 percent gravel
Rock fragments: less than 35 percent
Reaction: neutral to moderately alkaline
Depth to calcic horizon: 5 to 20 inches
Clay content: greater than 35 percent in the control section
Effervescence: none to violently
Calcium carbonate equivalent: ranges from 5 to 40 percent, averages 15 to 40 percent
Organic matter: 1 to 2 percent

A horizon
  Hue: 10YR, 7.5YR
  Value: 3 or 4 dry, 2 or 3 moist
  Chroma: 2 or 3, dry or moist
  Texture: fine sandy loam, sandy loam, loam

B horizon
  Hue: 5YR, 7.5YR
  Value: 3 through 5 dry, 2 or 3 moist
  Chroma: 2 through 4, dry or moist
  Texture: clay loam, clay

2Bk horizon
  Hue: 7.5YR, 10YR
  Value: 5 through 8 dry, 4 through 7 moist
  Chroma: 2 through 4, dry or moist
  Texture: sandy loam, loamy sand, clay loam

Blacktail Series

Depth class: very deep
Drainage class: well
Permeability: slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 8 to 15 percent
Elevation: 5000 to 5400 feet
Classification: Fine, mixed, thermic Aridic Argiustolls

Typical Pedon

Blacktail gravelly sandy loam, 8 to 15 percent slopes, located at a latitude of 31 degrees, 46 minutes, 01 seconds North and longitude of 109 degrees, 53 minutes, 40 seconds West; 2125 feet south and 1860 feet west from the northeast corner of section 21, Township 19S., Range 24 E.

A--0 to 1 inch; brown to dark brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, sticky and slightly plastic; common very fine and fine roots; few fine interstitial pores; 33 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt1--1 to 8 inches; dark reddish brown (5YR 3/2) gravelly clay, dark reddish brown (5YR 2.5/2) moist; moderate medium prismatic parting to weak fine angular blocky structure; soft, very friable, sticky and very plastic; common very fine and fine roots; few fine tubular pores; many distinct clay films on ped faces and gravel; 23 percent gravel; noneffervescent; neutral (pH 7.0); clear smooth boundary.

Bt2--8 to 16 inches; dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium prismatic parting to moderate fine angular blocky structure; soft, friable, sticky and very plastic; common very fine and fine roots; few fine tubular pores; many distinct clay films on ped faces and on gravel; 10 percent gravel; noneffervescent; neutral (pH 7.2); abrupt wavy boundary.

2Bt--16 to 34 inches; yellowish red (5YR 4/6) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; few fine tubular pores; few patchy clay films on ped faces and on gravel; 20 percent gravel; slightly effervescent, 6 percent calcium carbonate equivalent, with disseminated calcium carbonate; slightly alkaline (pH 7.8); abrupt wavy boundary.

2Bk--34 to 43 inches; 50 percent light brown (7.5YR 6/2) and 50 percent brown (7.5YR 5/3) gravelly sandy loam, brown (7.5YR 5/3) moist; massive; soft, friable, slightly sticky and plastic; few very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on gravel; 29 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); clear wavy boundary.

3Ck--43 to 60 inches; light brown (7.5YR 6/3) gravelly loamy sand, brown (7.5YR 5/3) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine and fine roots; few fine interstitial pores; many distinct calcium carbonate coatings on gravel; 33 percent gravel; strongly effervescent, 9 percent calcium carbonate equivalent; moderately alkaline (pH 8.0).

Range in Characteristics

Surface rock fragments: 30 to 40 percent gravel
Rock fragments: less than 35 percent
Reaction: neutral to moderately alkaline
Clay content: greater than 35 percent in the control section
Organic matter: 1 to 2 percent in the surface

Some soils mapped as Blacktail have slightly less calcium carbonate at 20 to 40 inches than is recognized in the series. Use and management are not significantly affected.

A horizon
Hue: 10YR, 7.5YR
Value: 3 or 4 dry, 2 or 3 moist
Chroma: 2 through 4 dry, 0 through 3 moist
Texture: sandy loam, loam

Bt horizon
Hue: 5YR, 7.5YR
Value: 3 or 4 dry, 2.5 or 3 moist
Chroma: 2 through 4 dry, 0 through 4 moist
Texture: clay, sandy clay, clay loam

2Bt horizon
Hue: 5YR, 7.5YR
Value: 3 or 4 dry, 3 or 4 moist
Chroma: 3 through 6 dry, 3 or 4 moist

Texture: clay, sandy clay loam
Effervescence: slightly to strongly
Calcium carbonate equivalent: 5 to 15 percent

2Bk horizon
Value: 5 or 6, dry or moist
Chroma: 2 or 3, dry or moist
Effervescence: slightly to strongly
Calcium carbonate equivalent: 10 to 20 percent

3C horizon
Value: 5 or 6, dry or moist
Chroma: 3 or 4, dry or moist
Texture: sandy loam, loamy sand
Effervescence: slightly to strongly
Calcium carbonate equivalent: 5 to 15 percent

Bodecker Series

Depth class: very deep
Drainage class: excessively
Permeability: very rapid
Landform: flood plains
Parent material: mixed stream alluvium
Slope range: 0 to 3 percent
Elevation: 4500 to 5200 feet
Classification: Sandy-skeletal, mixed, thermic Ustic Torriorthents

Typical Pedon

Bodecker loamy fine sand in an area of Riverwash - Bodecker complex, 0 to 3 percent slopes, located at a latitude of 31 degrees, 44 minutes, 25 seconds North and longitude of 110 degrees, 07 minutes, 05 seconds West; 2095 feet west and 1710 south from the northeast corner of section 32, Township 19 S., Range 22 E.

C1--0 to 3 inches; brown (10YR 5/3) loamy fine sand, brown to dark brown (10YR 4/3) moist; moderate medium platy structure; loose, nonsticky and nonplastic; few very fine and fine roots; common fine interstitial pores; strongly effervescent; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2--3 to 12 inches; brown (10YR 5/3) gravelly sand, brown to dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; common fine roots; common fine interstitial pores; 21 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C3--12 to 29 inches; brown (10YR 5/3) very gravelly coarse sand, brown to dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; few fine roots; common medium interstitial pores; 41 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C4--29 to 48 inches; brown (10YR 6/3) gravelly sand, pale brown (10YR 5/3) moist; massive; loose, nonsticky and nonplastic; few very fine and fine roots; common medium interstitial pores; 19 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); clear wavy boundary.

C5--48 to 60 inches; brown (10YR 5/3) very gravelly coarse sand, brown to dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; few very fine and fine roots; common medium interstitial pores; 45 percent gravel; strongly effervescent; moderately alkaline (pH 8.0).

Range in Characteristics

Rock fragments: averages more than 35 percent in the control section
Reaction: slightly to moderately alkaline
Clay content: 3 to 10 percent
Effervescence: strongly to violently

C horizon
Hue: 10YR, 7.5YR
Value: 4 through 6 dry, 3 through 5 moist
Chroma: 3 or 4, dry or moist
Texture: loamy fine sand, sand, coarse sand

Bonita Series

Depth class: very deep
Drainage class: well
Permeability: slow
Landform: flood plains
Parent material: mixed stream alluvium
Slope range: 0 to 3 percent
Elevation: 4500 to 4750 feet
Classification: Fine, montmorillonitic, thermic Typic Haplotorrerts

Typical Pedon

Bonita silt loam in an area of Forrest - Bonita complex, 0 to 3 percent slopes, located at a latitude of 31 degrees, 41 minutes, 04 seconds North and longitude of 109 degrees, 59 minutes, 18 seconds West; 1825 feet west and 950 feet south from the northeast corner of section 21, Township 20 S., Range 23 E.

C--0 to 2 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate thin platy structure; soft, very friable, nonsticky and plastic; common very fine and fine roots; common fine interstitial pores; noneffervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Cy1--2 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; few fine tubular pores; few fine gypsum crystals; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Cy2--5 to 20 inches; dark brown (7.5YR 3/2) silty clay, black (7.5YR 2/0) moist; strong coarse angular blocky structure parting to moderate coarse wedge; hard, firm, very sticky and very plastic; common fine roots; few fine tubular pores; common pressure faces on ped faces; common intersecting slickensides; few fine gypsum crystals; very slightly effervescent; slightly alkaline (pH 7.6); clear smooth boundary.

2Bty--20 to 40 inches; dark reddish gray (5YR 4/2), reddish brown (5YR 5/4) and reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/3) moist; strong medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine and fine roots; few very fine tubular pores; common distinct clay films on ped faces and few distinct organic coatings on ped faces and lining pores; few fine and medium gypsum crystals; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

3Btyb--40 to 60 inches; 80 percent reddish brown (5YR 5/4) and 20 percent pink (5YR 8/3) clay loam, 80 percent reddish brown (5YR 4/4) and 20 percent pink (5YR 7/3) moist; moderate medium subangular blocky structure; slightly hard, friable, very sticky and very plastic; few very fine roots; few very fine tubular pores; many distinct calcium carbonate coatings on ped faces and in pores; common fine calcium carbonate filaments and few fine and medium gypsum crystals; violently effervescent, 6 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Rock fragments: less than 15 percent
Reaction: slightly or moderately alkaline
Effervescence: slightly to violently
Depth to buried horizon: 25 to 40 inches
Organic matter: 1 to 2 percent

C horizon
- Hue: 7.5YR, 10YR
- Value: 3 through 5 dry, 2 or 3 moist
- Chroma: 0 through 3, dry or moist
- Texture: silt loam, silty clay loam, silty clay, clay
- Calcium carbonate equivalent: 1 to 5 percent
- Gypsum percent: trace

B horizon
- Hue: 5YR, 7.5YR
- Value: 3 through 5 dry, 3 or 4 moist
- Chroma: 2 through 4 dry, 3 or 4 moist
- Texture: clay loam, clay
- Calcium carbonate equivalent: 5 to 10 percent
- Gypsum percent: trace

Budlamp Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Landform: mountains
Parent material: slope alluvium and residuum from granodiorite
Slope range: 30 to 60 percent
Elevation: 5300 to 6200 feet
Classification: Loamy-skeletal, mixed, thermic Lithic Haplustolls

Typical Pedon

Budlamp very gravelly sandy loam in an area of Budlamp - Woodcutter complex, 30 to 60 percent slopes, located at a latitude of 31 degrees, 46 minutes, 10 seconds North and longitude of 109 degrees, 52 minutes, 50 seconds West; 1150 feet west and 1200 feet south from the northeast corner of section 22, Township 19 S., Range 24 E.

A--0 to 1 inch; brown to dark brown (10YR 4/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak granular structure; loose, nonsticky and nonplastic; few fine roots; common fine interstitial pores; 40 percent gravel; noneffervescent; neutral (pH 6.8); clear smooth boundary.

C--1 to 7 inches; dark brown (10YR 3/3) very gravelly sandy loam, dark brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; many fine roots; common fine interstitial and tubular pores; 50 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

R--7 inches; granodiorite.

Range in Characteristics

Surface rock fragments: 40 to 50 percent gravel and cobble
Rock fragments: 40 to 55 percent
Reaction: moderately acid to neutral
Depth to bedrock: 6 to 15 inches
Clay content: 5 to 18 percent
Organic matter: 1 to 3 percent

A and C horizon
    Hue: 10YR, 7.5YR
    Value: 3 or 4 dry, 2 or 3 moist
    Chroma: 2 or 3 dry, 1 through 3 moist
    Texture: sandy loam, fine sandy loam

Chiricahua Series

Depth class: shallow
Drainage class: well
Permeability: slow
Landform: hills
Parent material: slope alluvium and residuum from granite, granodiorite and gneiss quartzite
Slope range: 3 to 30 percent
Elevation: 4100 to 5400 feet
Classification: Clayey, mixed, thermic, shallow Ustollic Haplargids

Typical Pedon

Chiricahua very gravelly clay loam, 8 to 15 percent slopes, located at a latitude of 31 degrees, 41 minutes, 53 seconds North and longitude of 110 degrees, 05 minutes, 40 seconds West; 1400 feet south, 100 feet east of the northwest corner of section 15, Township 20 S., Range 22 E.

A--0 to 1 inch; reddish brown (2.5YR 4/4) very gravelly clay loam, dark reddish brown (2.5YR 3/4) moist; weak fine and medium platy structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; common fine interstitial and few tubular pores; 45 percent gravel; noneffervescent; slightly acid (pH 6.5); abrupt smooth boundary.

Bt1--1 to 4 inches; reddish brown (2.5YR 4/4) gravelly clay loam, dark reddish brown (2.5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial and few fine tubular pores; few distinct clay films on ped faces; 30 percent gravel; noneffervescent; slightly acid (pH 6.5); clear smooth boundary.

Bt2--4 to 9 inches; dark reddish brown (2.5YR 3/4) gravelly clay, dark reddish brown (2.5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and medium roots and common very fine roots; common very fine tubular pores; common distinct clay films on ped faces; 30 percent gravel; noneffervescent; neutral (pH 6.8); clear smooth boundary.

Bt3--9 to 18 inches; dark red (2.5YR 3/6) clay dark reddish brown (2.5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and very plastic; common very fine and fine roots; common very fine and fine tubular pores; 5 percent gravel; many distinct clay films on ped faces; noneffervescent; neutral (pH 7.0); abrupt wavy boundary.

Bt4--18 to 20 inches; dark red (2.5YR 3/6) gravelly clay, dark reddish brown (2.5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, sticky and very plastic; common fine and medium roots; common very fine and fine tubular pores; 30 percent gravel; many distinct clay films on ped faces; noneffervescent; neutral (pH 7.0); abrupt irregular boundary.

R--20 inches; quartzite

Range in Characteristics

Surface rock fragments: 40 to 50 percent gravel and cobble
Rock fragments: 15 to 40 percent
Reaction: slightly acid to neutral
Depth to weathered bedrock: 10 to 20 inches
Thickness of weathered bedrock: 1 to 3 inches thick

Depth to unweathered bedrock: 20 to 30 inches
Clay content: greater than 35 percent
Organic matter: 1 to 2 percent

A horizon
  Hue: 2.5YR, 5YR
  Value: 3 or 4, dry or moist
  Chroma: 3 or 4, dry or moist
  Texture: clay loam, loam

B horizon
  Hue: 2.5YR, 5YR
  Value: 3 or 4, dry or moist
  Chroma: 4 through 6, dry or moist
  Texture: clay, clay loam

Combate Series

Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Landform: alluvial fans
Parent material: fan alluvium from granite and gneiss
Slope range: 0 to 3 percent
Elevation: 4000 to 5000 feet
Classification: Coarse-loamy, mixed, nonacid, thermic Ustic Torrifluvents

Typical Pedon

Combate loamy sand, 0 to 3 percent slopes, located at a latitude of 31 degrees, 44 minutes, 03 seconds North and longitude of 110 degrees, 06 minutes, 20 seconds West; 1695 feet east and 1290 feet north from the southwest corner of section 33, Township 19 S., Range 22 E.

C1--0 to 2 inches; brown (7.5YR 5/3) loamy sand, dark brown (7.5YR 3/3) moist; weak medium platy structure; loose, nonsticky and nonplastic; common very fine roots; common fine interstitial pores; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

C2--2 to 8 inches; brown to dark brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine interstitial and tubular pores; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

C3--8 to 26 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine interstitial and tubular pores; noneffervescent; slightly alkaline (pH 7.4); clear smooth boundary.

C4--26 to 32 inches; dark yellowish brown (10YR 4/4) coarse sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; noneffervescent to very slightly effervescent; slightly alkaline (pH 7.6); clear smooth boundary.

Ck--32 to 60 inches; yellowish brown (10YR 5/4) sandy loam, brown to dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; few fine tubular pores; few fine calcium carbonate filaments; slightly effervescent; moderately alkaline (pH 8.0).

Range in Characteristics

Rock fragments: 5 to 20 percent
Clay content: 5 to 16 percent
Effervescence: none to 20 inches, slight to strongly below 20 inches
Calcium carbonate equivalent: 0 to 3 percent below 20 inches
Organic matter: 1 to 2 percent

C horizon
  Hue: 10YR, 7.5YR
  Value: 3 through 5 dry, 3 or 4 moist
  Chroma: 2 through 4, dry or moist
  Texture: sandy loam, coarse sandy loam, loamy sand, loamy fine sand
  Effervescence: none to strongly
  Reaction: neutral to moderately alkaline

Elgin Series

Depth class: very deep
Drainage class: well
Permeability: slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 8 to 12 percent
Elevation: 4500 to 5000 feet

Classification: Fine, mixed, thermic Ustollic Paleargids

Typical Pedon

Elgin very gravelly fine sandy loam in an area of Elgin - Stronghold complex, 8 to 15 percent slopes, located at a latitude of 31 degrees, 44 minutes, 28 seconds North and longitude of 109 degrees, 56 minutes, 30 seconds West; 2325 feet north and 350 feet west from the southeast corner of section 36, Township 19 S., Range 23 E.

A--0 to 1 inch; brown to dark brown (10YR 4/3) very gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine interstitial and tubular pores; 38 percent gravel and 5 percent cobble; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt1--1 to 6 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2.5/2) moist; moderate medium angular blocky structure; slightly hard, firm, very sticky and very plastic; common very fine and fine roots; common fine tubular pores; many distinct clay films on ped faces and on rock fragments; 10 percent gravel; noneffervescent; neutral (pH 6.8); clear smooth boundary.

Bt2--6 to 15 inches; dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/3) moist; moderate medium angular blocky structure; slightly hard, firm, very sticky and very plastic; common very fine and fine roots; common fine tubular pores; many distinct clay films on ped faces and on rock fragments; 10 percent gravel; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.

Btk--15 to 21 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots; few fine tubular pores; common distinct clay films on rock fragments; common distinct calcium carbonate coatings on rock fragments; 25 percent gravel; slightly effervescent, 11 percent calcium carbonate equivalent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Bk1--21 to 27 inches; 70 percent light reddish brown (5YR 6/4) and 30 percent reddish brown (5YR 4/4) gravelly sandy loam, 70 percent pink (5YR 7/4) and 30 percent reddish brown (5YR 5/4) moist; massive; soft, friable, nonsticky and nonplastic; common fine roots; few fine interstitial and tubular pores; many distinct calcium carbonate coatings on rock fragments; 30 percent gravel; violently effervescent, 11 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); clear smooth boundary.

Bk2--27 to 60 inches; pinkish gray (7.5YR 7/2) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine roots; few fine interstitial and tubular pores; many distinct calcium carbonate coatings on rock fragments; 40 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Surface rock fragments: 25 to 30 percent gravel
Rock fragments: less than 35 percent in the control section
Reaction: slightly acid to moderately alkaline
Depth to calcic horizon: 20 to 40 inches
Clay content: more than 35 percent
Organic matter: 1 to 2 percent

A horizon
- Hue: 7.5YR, 10YR
- Value: 3 or 4, dry or moist
- Chroma: 2 through 4, dry or moist
- Texture: sandy loam, fine sandy loam
- Reaction: slightly acid or neutral

Bt horizon
- Hue: 2.5YR, 5YR
- Value: 2.5 through 5, dry or moist
- Chroma: 2 through 4, dry or moist
- Texture: clay loam, clay, sandy clay
- Reaction: neutral to slightly alkaline

Btk horizon
- Hue: 2.5YR, 5YR
- Value: 4 through 7, dry or moist
- Chroma: 3 or 4, dry or moist
- Reaction: neutral to moderately alkaline
- Calcium carbonate equivalent: 5 to 15 percent
- Effervescence: slightly to strongly

Bk horizon
- Hue: 5YR, 7.5YR
- Value: 4 through 7, dry or moist
- Chroma: 2 through 4, dry or moist
- Reaction: slightly to moderately alkaline
- Calcium carbonate equivalent: 10 to 25 percent

Effervescence: strongly to violent

Epitaph Series

Depth class: moderately deep
Drainage class: well
Permeability: slow
Landform: hills
Parent material: slope alluvium and residuum from basalt
Slope range: 3 to 15 percent
Elevation: 4700 to 4900 feet
Classification: Fine, montmorillonitic, thermic Leptic Haplotorrerts

Typical Pedon

Epitaph very cobbly clay loam, 3 to 15 percent slopes, located at a latitude of 31 degrees, 54 minutes, 35 seconds North and longitude of 110 degrees, 42 minutes, 16 seconds West; 510 feet north and 990 feet west from the southeast corner of section 9, Township 20 S., Range 23 E.

A--0 to 1 inch; dark brown (7.5YR 3/2) very cobbly clay loam, very dark brown (7.5YR 2/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and plastic; few fine roots; few very fine tubular pores; common vertical cracks .25 to 1 inch thick; 15 percent gravel and 30 percent cobble; noneffervescent; slightly alkaline (pH 7.6); abrupt smooth boundary.

Bt--1 to 6 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2.5/2) moist; weak medium wedge shaped peds parting to strong medium angular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots and few medium roots; few very fine tubular pores; common vertical cracks .25 to 1 inch thick; common distinct clay films on ped faces and lining pores; noneffervescent; slightly alkaline (pH 7.6); clear smooth boundary.

Bss--6 to 27 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2.5/2) moist; weak medium wedge shaped peds parting to strong medium angular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; few very fine tubular pores; common distinct clay films on ped faces and lining pores; few intersecting slickensides; slightly effervescent; moderately alkaline (pH 8.0); abrupt wavy boundary.

2Bkm--27 to 38 inches; indurated hardpan; extremely hard, strongly cemented by calcium carbonate; violently effervescent; abrupt wavy boundary.

3R--38 inches; basalt.

Range in Characteristics

Surface rock fragments: 40 to 50 percent gravel and cobble
Reaction: slightly to moderately alkaline
Depth to hardpan: 20 to 40 inches
Depth to bedrock: 25 to 40 inches
Clay content: more than 35 percent
Organic matter: 1 to 2 percent
Soil cracks: common vertical cracks .25 to 1.5 inches wide
Slickensides: few

A horizon
    Hue: 5YR, 7.5YR
    Value: 2 or 3, dry or moist
    Chroma: 2 or 3, dry or moist
    Texture: clay loam, silt loam, loam

B horizon
    Hue: 2.5YR, 5YR
    Value: 2 or 3 dry, 2.5 through 4 moist
    Chroma: 2 or 3 dry, 2 through 4 moist
    Texture: clay, clay loam

Forrest Series

Depth class: very deep
Drainage class: well
Permeability: slow
Landform: basin floor
Parent material: mixed fan alluvium
Slope range: 0 to 3 percent
Elevation: 4500 to 4750 feet
Classification: Fine, mixed, thermic Ustollic Haplargids

Typical Pedon

Forrest fine sandy loam in an area of Forrest - Bonita complex, 0 to 3 percent slopes, located at a latitude of

31 degrees, 41 minutes, 01 seconds North and longitude of 109 degrees, 59 minutes, 57 seconds West; 1525 west feet and 1150 feet from the northeast corner of section 21, Township 20 S., Range 23 E.

A--0 to 1 inch; brown to dark brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak thick platy structure; loose, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine vesicular pores; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt--1 to 7 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium angular blocky structure; slightly hard, friable, very sticky and very plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; many distinct clay films on ped faces and lining pores; very slightly effervescent, 2 percent calcium carbonate equivalent; neutral (pH 7.0); clear smooth boundary.

Bty--7 to 22 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium prismatic parting to moderate fine and medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine and fine interstitial and tubular pores; many distinct clay films on ped faces and lining pores; few fine gypsum crystals; very slightly effervescent, 2 percent calcium carbonate equivalent; neutral (pH 7.2); abrupt smooth boundary.

Btky1--22 to 39 inches; 60 percent yellowish red (5YR 4/6) and 40 percent pinkish white (5YR 8/2) clay loam, 60 percent reddish brown (5YR 4/4) and 40 percent light reddish brown (5YR 6/3) moist; moderate fine subangular blocky structure; slightly hard, firm, very sticky and very plastic; common very fine and fine roots; common fine interstitial and tubular pores; many distinct clay films and calcium carbonate coats on ped faces; common medium and coarse cylindrical soft masses of calcium carbonate; few fine gypsum crystals; violently effervescent, 23 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); gradual smooth boundary.

Btky2--39 to 50 inches; 70 percent reddish brown (5YR 5/4) and 30 percent pinkish gray (5YR 7/2) sandy clay loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine interstitial and tubular pores; many distinct calcium carbonate coats and common clay films on ped faces; common medium and coarse cylindrical soft masses of calcium carbonate; few fine gypsum crystals; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt wavy boundary.

Bky--50 to 60 inches; 70 percent light reddish brown (5YR 6/3) and 30 percent pinkish white (5YR 8/2) sandy clay loam, reddish brown (5YR 5/4) moist; weak fine subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common fine vesicular, interstitial and tubular pores; many distinct calcium carbonate coats on ped faces; common fine gypsum crystals; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt wavy boundary.

Range in Characteristics

Rock fragments: 0 to 5 percent
Depth to calcic horizon: 20 to 40 inches
Clay content: greater than 35 percent in the control section
Organic matter: 1 to 2 percent in the surface

A horizon
- Hue: 5YR, 7.5YR
- Value: 3 or 4, dry or moist
- Chroma: 3 or 4, dry or moist
- Effervescence: none to strongly
- Reaction: neutral to moderately alkaline

Bt and Bty horizon
- Hue: 5YR, 7.5YR
- Value: 3 or 4, dry or moist
- Chroma: 3 or 4, dry or moist
- Texture: sandy clay loam, clay
- Effervescence: none to strongly
- Reaction: neutral to moderately alkaline
- Calcium carbonate equivalent: 2 to 8 percent
- Gypsum percent: trace amounts in some pedons

Btky horizon
- Hue: 5YR, 7.5YR
- Value: 4 through 8 dry, 4 through 6 moist
- Chroma: 2 through 6 dry, 3 or 4 moist
- Texture: clay loam, sandy clay loam
- Effervescence: strongly to violently
- Reaction: slightly to moderately alkaline
- Calcium carbonate equivalent: 8 to 30 percent
- Gypsum percent: trace amounts in some pedons

Bky horizon
- Hue: 5YR, 7.5YR

Value: 6 through 8 dry, 5 through 7 moist
Chroma: 2 through 4 dry or moist
Texture: sandy loam, sandy clay loam
Efferescence: strongly to violently
Reaction: moderately alkaline
Calcium carbonate equivalent: 15 to 30 percent
Gypsum percent: trace amounts in some pedons

Graham Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: slow
Landform: hills
Parent material: slope alluvium and residuum from basalt
Slope range: 8 to 30 percent
Elevation: 4500 to 5590 feet
Classification: Clayey, montmorillonitic, thermic Lithic Ustollic Haplargids

Typical Pedon

Graham very cobbly loam in an area of Graham - Lampshire complex, 15 to 30 percent slopes, located at a latitude of 31 degrees, 42 minutes, 24 seconds North and longitude of 110 degrees, 00 minutes, 03 seconds West; 2425 feet west and 1910 feet north from the southeast corner of section 9, Township 20 S., Range 23 E.

A--0 to 1 inch; brown to dark brown (7.5YR 4/2) very cobbly loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; common fine tubular pores; 40 percent cobble; noneffervescent; neutral (pH 6.8); clear smooth boundary.

Bt--1 to 10 inches; reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2.5/2) moist; strong medium angular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; common fine tubular pores; common distinct clay films on ped faces; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

R--10 inches; basalt.

Range in Characteristics

Surface rock fragments: 45 to 55 percent gravel, cobble and stone
Rock fragments: 10 to 40 percent gravel and cobble
Reaction: neutral or slightly alkaline
Depth to bedrock: 8 to 20 inches
Clay content: more than 35 percent
Organic matter: 1 to 3 percent

A horizon
Hue: 7.5YR, 10YR
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 2 or 3, dry or moist
Texture: clay loam, loam, fine sandy loam

Bt horizon
Hue: 5YR, 7.5YR
Value: 3 or 4 dry, 2 or 3 moist
Chroma: 2 or 3, dry or moist
Texture: clay, silty clay

Grizzle Series

Depth class: moderately deep
Drainage class: well
Permeability: moderately slow
Landform: hills
Parent material: slope alluvium and residuum from sandstone and shale
Slope range: 3 to 8 percent
Elevation: 4500 to 5000 feet
Classification: Fine-loamy, mixed, thermic Ustalfic Haplargids

Typical Pedon

Grizzle coarse sandy loam, 3 to 8 percent slopes, located at a latitude of 32 degrees, 41 minutes, 02 seconds North and longitude of 109 degrees, 59 minutes, 40 seconds West; 200 feet west and 1050 feet south from the northeast corner of section 20, Township 20 S., Range 23 E.

A--0 to 1 inch; reddish brown (5YR 5/3) coarse sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; loose, nonsticky and nonplastic; common very fine and fine roots; common fine interstitial pores; violently effervescent; slightly alkaline (pH 7.8); abrupt smooth boundary.

Btk--1 to 6 inches; reddish brown (5YR 5/3) clay loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, sticky and plastic; common very fine and fine roots; common fine tubular pores; common distinct clay films between sand grains; common distinct calcium carbonate coatings on ped faces; violently effervescent, 24 percent calcium carbonate equivalent; moderately alkaline (pH 8.0); abrupt smooth boundary.

2Cdk1--6 to 14 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; occurs as horizontal plates 1 to 3 inches thick; hard, very firm and brittle, slightly sticky and plastic; common very fine and fine roots; many distinct white (5YR 8/1) calcium carbonate coatings on plates and lining pores; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

2Cdk2--14 to 32 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; occurs as horizontal plates 1 to 3 inches thick; very hard, very firm and brittle, slightly sticky and plastic; common very fine and fine roots; many distinct white (5YR 8/1) calcium carbonate coatings on plates and lining pores; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

3Crk--32 to 50 inches; weathered sandstone; many distinct calcium carbonate coatings between rock fractures; violently effervescent.

3R--50 to 60 inches; sandstone.

Range in Characteristics

Reaction: slightly or moderately alkaline
Depth to weathered bedrock: 20 to 40 inches
Depth to unweathered bedrock: 25 to 60 inches
Clay content: 18 to 35 percent
Effervescence: strongly or violently effervescence
Depth to calcic horizon: 1 to 10 inches

A horizon
Hue: 7.5YR, 5YR
Value: 4 through 6 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: coarse sandy loam, loam, fine sandy loam
Calcium carbonate equivalent: 5 to 10 percent

Btk horizon
Hue: 5YR, 2.5YR
Value: 4 through 6 dry, 3 or 4 moist
Chroma: 3 or 4, dry or moist
Texture: clay loam, loam
Calcium carbonate equivalent: 15 to 30 percent

Cd horizon
Hue: 5YR, 2.5YR
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 3 or 4, dry or moist
Texture: loam, clay loam, when crushed
Calcium carbonate equivalent: 10 to 25 percent

In most pedons the Cd horizon is hard or very hard and breaks down after prolonged soaking shaking in water.

Lampshire Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Landform: hills
Parent material: slope alluvium and residuum from igneous rock
Slope range: 3 to 60 percent
Elevation: 4100 to 5800 feet
Classification: Loamy-skeletal, mixed, nonacid, thermic Lithic Ustic Torriorthents

Typical Pedon

Lampshire very stony loam in an area of Graham - Lampshire complex, 15 to 30 percent slopes, located at a latitude of 31 degrees, 42 minutes, 22 seconds North and longitude of 110 degrees, 00 minutes, 02 seconds West; 2430 feet west and 1825 feet north from the southeast corner of section 9, Township 20 S., Range 23 E.

A--0 to 5 inches; brown to dark brown (7.5YR 4/2) very stony loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine interstitial and tubular pores; 15 percent stones, 15 percent cobble and 20 percent gravel; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.

R--5 inches; basalt.

Range in Characteristics

Surface rock fragments: 45 to 55 percent gravel, cobble and stones
Rock fragments: 35 to 70 percent
Reaction: neutral to slightly alkaline

Depth to bedrock: 4 to 20 inches
Clay content: 10 to 20 percent
Organic matter: 1 to 2 percent

A horizon
- Hue: 10YR, 7.5YR
- Value: 3 or 4, dry or moist
- Chroma: 2 through 4, dry or moist
- Texture: loam, fine sandy loam

Luckyhills Series

Depth class: very deep
Drainage class: well
Permeability: moderate
Landform: fan terraces
Parent material: mixed calcareous fan alluvium
Slope range: 0 to 15 percent
Elevation: 4000 to 4800 feet
Classification: Coarse-loamy, mixed, thermic Ustochreptic Calciorthids

Typical Pedon

Luckyhills very gravelly sandy loam in an area of Luckyhills - McNeal complex, 3 to 8 percent slopes, located at a latitude of 31 degrees, 41 minutes, 35 seconds North and longitude of 110 degrees, 03 minutes, 02 seconds West; 1520 feet south and 75 feet east from the northwest corner of section 36, Township 19 S., Range 22 E.

A--0 to 2 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown to dark brown (10YR 4/3) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine vesicular and interstitial pores; 37 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--2 to 13 inches; 70 percent pale brown (10YR 6/3) and 30 percent white (10YR 8/2) gravelly sandy loam, brown to dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine interstitial and tubular pores; many distinct calcium carbonate coatings on rock fragments; 29 percent gravel; violently effervescent, 25 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt wavy boundary.

Bk2--13 to 31 inches; 70 percent pinkish white (7.5YR 8/2) and 30 percent pinkish gray (7.5YR 7/2) sandy loam, brown to dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; common fine soft masses of calcium carbonate; 12 percent gravel; violently effervescent, 28 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); gradual wavy boundary.

Bk3--31 to 39 inches; 80 percent light brown (7.5YR 6/3) and 20 percent pinkish white (7.5YR 8/2) gravelly sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine tubular pores; many distinct calcium carbonate coatings on ped faces and on rock fragments; common fine soft masses of calcium carbonate; 27 percent gravel; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); gradual wavy boundary.

Bk4--39 to 60 inches; 80 percent light brown (7.5YR 6/3) and 20 percent pink (7.5YR 8/3) gravelly loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common fine tubular pores; many distinct calcium carbonate coatings on rock fragments and on ped faces; common fine soft masses of calcium carbonate; 29 percent gravel; strongly effervescent; 18 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Surface rock fragments: 10 to 55 percent gravel
Rock fragments: less than 35 percent
Reaction: slightly to moderately alkaline
Depth to calcic horizon: 2 to 20 inches
Clay content: 5 to 18 percent
Effervescence: strongly to violently
Calcium carbonate equivalent: 6 to 30 percent

A horizon
- Hue: 10YR, 7.5YR
- Value: 5 or 6 dry, 3 or 4 moist
- Chroma: 2 through 4, dry or moist
- Texture: coarse sandy loam, sandy loam, loamy sand

Bk horizon
- Hue: 10YR, 7.5YR
- Value: 5 through 8 dry, 3 through 7 moist

Chroma: 2 through 4 dry, 3 through 6 moist
Texture: sandy loam, loam, fine sandy loam, silt loam

Mabray Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: moderate
Landform: hills
Parent material: slope alluvium and residuum from limestone
Slope range: 3 to 45 percent
Elevation: 4100 to 5400 feet
Classification: Loamy-skeletal, carbonatic, thermic Lithic Ustic Torriorthents

Typical Pedon

Mabray extremely cobbly loam in an area of Mabray - Rock outcrop complex, 3 to 15 percent slopes, located at a latitude of 31 degrees, 41 minutes, 02 seconds North and longitude of 110 degrees, 02 minutes, 01 seconds West; about 700 feet south and 3040 feet east of the northwest corner of section 19, Township 20 S., Range 23 E. Cochise County, Arizona, about 300 feet west of Highway U. S. 80, south of rain gauge #30.

A--0 to 8 inches; dark grayish brown (10YR 4/2) extremely cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 25 percent cobble and 45 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Ck--8 to 11 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 20 percent gravel and 20 percent cobble; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

R--11 inches; limestone.

Range in Characteristics

Surface rock fragments: 45 to 60 percent gravel and cobble
Rock fragments: 15 to 50 percent cobbles and 20 to 45 percent gravel
Reaction: slightly to moderately alkaline
Depth to bedrock: 4 to 20 inches
Clay content: ranges from 15 to 25 percent, averages more than 18 percent
Effervescence: strongly to violently
Calcium carbonate equivalent: 40 to 60 percent
Organic matter: 1 to 2 percent

A horizon
Hue: 10YR, 7.5YR
Value: 2 through 4 dry, 2 or 3 moist
Chroma: 2 through 4 dry, 1 through 3 moist
Texture: loam, fine sandy loam

Ck horizon
Hue: 10YR, 7.5YR
Value: 3 through 5, dry or moist
Chroma: 2 through 4, dry or moist
Texture: loam, fine sandy loam

McAllister Series

Depth class: very deep
Drainage class: well
Permeability: moderately slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 3 to 8 percent
Elevation: 4500 to 5000 feet
Classification: Fine-loamy, mixed, thermic Ustollic Haplargids

Typical Pedon

McAllister gravelly fine sandy loam in an area of McAllister - Stronghold complex, 3 to 8 percent slopes, located at a latitude of 31 degrees, 44 minutes, 35 seconds North and longitude of 110 degrees, 00 minutes, 58 seconds West; 2280 feet west and 395 south from the northeast corner of section 32, Township 19 S., Range 23 E.

A--0 to 2 inches; brown (7.5YR 5/3) gravelly fine sandy loam, brown to dark brown (7.5YR 4/3) moist; weak medium platy structure; loose, nonsticky and nonplastic; common fine roots; common fine interstitial and tubular pores; 27 percent gravel; noneffervescent; slightly alkaline (pH 7.4); abrupt smooth boundary.

Bt--2 to 18 inches; reddish brown (5YR 4/4) gravelly sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common fine tubular pores; common distinct clay films on ped faces, lining pores and on rock fragments; common distinct organic coatings on rock fragments; 18 percent gravel; noneffervescent; slightly alkaline (pH 7.6); clear wavy boundary.

Btk--18 to 35 inches; yellowish red (5YR 5/6) gravelly sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; few fine tubular pores; common distinct clay films on ped faces, lining pores and on rock fragments; few patchy organic coatings and iron-manganese stains on ped faces; 21 percent gravel; slightly effervescent with disseminated calcium carbonate, 8 percent calcium carbonate equivalent; slightly alkaline (pH 7.8); abrupt wavy boundary.

2Btk--35 to 60; 70 percent light brown (7.5YR 6/3) and 30 percent yellowish red (5YR 5/6) sandy loam, reddish brown (5YR 5/3) moist; weak coarse subangular blocky structure; few fine roots; common fine tubular pores; few distinct clay films on ped faces and lining pores; many distinct calcium carbonate coatings on rock fragments; common fine calcium carbonate filaments; 12 percent gravel; strongly effervescent, 22 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Surface rock fragments: 35 to 45 percent gravel
Rock fragments: 5 to 30 percent
Reaction: slightly to moderately alkaline
Depth to calcic horizon: 20 to 40 inches
Clay content: 24 to 35 percent
Organic matter: 1 to 2 percent in the surface

A horizon
    Hue: 5YR, 7.5YR
    Value: 4 or 5 dry, 3 or 4 moist
    Chroma: 2 or 3, dry or moist
    Texture: fine sandy loam, sandy loam
    Effervescence: none to very slightly

Bt horizon
    Hue: 5YR, 7.5YR
    Value: 3 or 4, dry or moist
    Chroma: 3 or 4, dry or moist
    Texture: sandy clay loam, clay loam
    Effervescence: none to slightly

Btk horizon
    Hue: 5YR, 7.5YR
    Value: 5 or 6 dry, 4 or 5 moist
    Chroma: 4 through 6 dry, 3 through 6 moist
    Texture: sandy clay loam, sandy loam
    Effervescence: slightly to violently
    Calcium carbonate equivalent: 5 to 10 percent

2Btk horizon
    Hue: 5YR or 7.5YR
    Value: 5 or 6 dry, 4 or 5 moist
    Chroma: 3 through 6 dry, 3 or 4 moist
    Texture: coarse sandy loam, sandy loam
    Effervescence: slightly to violently
    Calcium carbonate equivalent: 15 to 30 percent

McNeal Series

Depth class: very deep
Drainage class: well
Permeability: moderately slow
Landform: fan terraces
Parent material: mixed fan alluvium
Slope range: 3 to 15 percent
Elevation: 4500 to 4750 feet
Classification: Fine-loamy, mixed, thermic Ustalfic Haplargids

Typical Pedon

McNeal very gravelly sandy loam in an area of Luckyhills - McNeal complex, 3 to 8 percent slopes, located at a latitude of 31 degrees, 44 minutes, 22 seconds North and longitude of 110 degrees, 03 minutes, 31 seconds West; 1275 feet south and 200 feet west from the northeast corner of section 36, Township 19 S., Range 22 E.

A--0 to 1 inch; strong brown (7.5YR 5/6) very gravelly sandy loam, brown to dark brown (7.5YR 4/4) moist; weak thin platy structure; loose, sticky and plastic; common very fine and fine roots; common fine interstitial and tubular pores; few fine vesicular pores; 38 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary.

Btk1--1 to 6 inches; yellowish red (5YR 4/6) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; few fine tubular pores; many distinct clay films on ped faces and common distinct calcium carbonate coatings on rock fragments; 10 percent gravel; strongly effervescent, 4 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

2Btk2--6 to 13 inches; 80 percent yellowish red (5YR 4/6) and 20 percent pink (5YR 7/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; common very fine and fine roots; few fine tubular pores; common distinct clay films on ped faces and many distinct calcium carbonate coatings on rock fragments; common fine soft masses of calcium carbonate; 10 percent gravel; violently effervescent, 43 percent calcium carbonate equivalent; moderately alkaline (pH 8.4) clear smooth boundary.

2Btk3--13 to 21 inches; 50 percent light reddish brown (5YR 6/4) and 50 percent pink (5YR 7/4) clay loam, light reddish brown (5YR 6/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine soft masses of calcium carbonate; 10 percent gravel; violently effervescent, 53 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary.

2Btk4--21 to 41 inches; 50 percent light reddish brown (5YR 6/4) and 50 percent pinkish white (5YR 8/2) sandy clay loam, light reddish brown (5YR 6/4) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine soft masses of calcium carbonate; 10 percent gravel; violently effervescent, 33 percent calcium carbonate equivalent; strongly alkaline (pH 8.6); abrupt smooth boundary.

3Btk5--41 to 60 inches; 90 percent strong brown (7.5YR 5/6) and 10 percent pinkish white (7.5YR 8/2) sandy loam, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine roots; many fine tubular pores; common distinct clay films on ped faces; many distinct calcium carbonate coatings on rock fragments; common fine calcium carbonate filaments; 10 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; strongly alkaline (pH 8.6).

Range in Characteristics

Surface rock fragments: 45 to 55 percent gravel
Reaction: slightly to moderately alkaline
Depth to calcic horizon: 5 to 20 inches
Clay content: 20 to 35 percent
Effervescence: strongly to violently
Calcium carbonate equivalent: 4 to 55 percent, averages more than 15 percent

A horizon
  Hue: 5YR, 7.5YR
  Value: 3 through 5, dry or moist
  Chroma: 3 through 6 dry, 3 or 4 moist

Btk horizon
  Hue: 5YR, 7.5YR
  Value: 4 through 8 dry, 4 through 6 moist
  Chroma: 2 through 6 dry, 4 through 6 moist
  Texture: clay loam, sandy clay loam, loam, sandy loam

Mule Series

Depth class: very deep
Drainage class: well
Permeability: moderate
Landform: fan terraces
Parent material: mixed calcareous fan alluvium
Slope range: 8 to 15
Elevation: 4200 to 4800 feet
Classification: Loamy-skeletal, carbonatic, thermic Ustollic Calciorthids

Typical Pedon

Walnut very gravelly fine sandy loam in an area of Sutherland - Walnut complex, 8 to 15 percent slopes, located at a latitude of 31 degrees, 41 minutes, 55 seconds North and longitude of 110 degrees, 01 minutes, 40 seconds West; 650 feet west and 790 feet south from the northeast corner of section 18, Township 20 S., Range 23 E.

A--0 to 2 inches; brown (7.5YR 5/3) very gravelly fine sandy loam, brown to dark brown (7.5YR 4/3) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial and tubular pores; 50 percent gravel; violently effervescent, 40 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--2 to 10 inches; brown (7.5YR 5/3) very gravelly fine sandy loam, brown to dark brown (7.5YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 5 percent cobble and 50 percent gravel; violently effervescent, 49 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); clear wavy boundary.

Bk2--10 to 22 inches; light brown (7.5YR 6/3) and pinkish white (7.5YR 8/2) very gravelly loam, brown (7.5YR 5/3) and pinkish gray (7.5YR 7/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 5 percent cobble and 43 percent gravel; violently effervescent, 67 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); clear wavy boundary.

Bk3--22 to 60 inches; pinkish white (7.5YR 8/2) and light brown (7.5YR 6/3) very gravelly loam, pinkish gray (7.5YR 7/2) and brown (7.5YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine interstitial and tubular pores; many distinct calcium carbonate coatings on rock fragments; 46 percent gravel; violently effervescent, 47 percent calcium carbonate equivalent; moderately alkaline (pH 8.4).

Range in Characteristics

Surface rock fragments: 45 to 55 percent gravel and cobble
Rock fragments: more than 35 percent
Reaction: slightly or moderately alkaline
Depth to calcic horizon: 2 to 10 inches
Clay content: 5 to 18 percent
Effervescence: strongly or violently
Organic matter: 1 to 3 percent

A horizon
  Hue: 7.5YR, 10YR
  Value: 4 or 5, dry or moist
  Chroma: 2 or 3, dry or moist
  Texture: fine sandy loam, loam
  Calcium carbonate equivalent: 30 to 45 percent

Bk horizon
  Hue: 7.5YR, 10YR
  Value: 5 through 8 dry, 4 through 7 moist
  Chroma: 2 or 3, dry or moist
  Texture: loam, fine sandy loam, sandy loam
  Calcium carbonate equivalent: 40 to 70 percent

Pedregosa Series

Depth class: very shallow or shallow to a hardpan
Drainage class: well drained
Permeability: moderately rapid
Landform: fan terraces
Parent material: mixed calcareous fan alluvium
Slope range: 3 to 20 percent
Elevation: 4000 to 5000 feet
Classification: Loamy-skeletal, mixed, superactive, thermic, shallow Ustic Petrocalcid

Typical Pedon

Pedregosa very gravelly fine sandy loam, 3 to 15 percent slopes, located at a latitude of 31 degrees, 40 minutes, 42.67 seconds North and longitude of 110 degrees, 01 minutes, 15.33 seconds West.

About 40 to 50 percent of the surface in covered with gravel and cobbles.

A--0 to 1 inch; brown (7.5YR 4/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; weak granular structure; loose, nonsticky and nonplastic; common very fine and fine roots; few fine irregular pores; 52 percent gravel; violently effervescent; 6.5 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk--1 to 7 inches; brown (7.5YR 4/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, moderately and moderately plastic; common very fine and fine and few medium roots; common fine irregular and tubular pores; many distinct calcium carbonate coatings on rock fragments; 40 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary.

Bkm--7 to 13 inches; fractured hardpan; extremely hard, strongly cemented by calcium carbonate; violently effervescent; abrupt wavy boundary.

2Ck--13 to 60 inches; 70 percent white (7.5YR 8/1) and 30 percent brown (7.5YR 5/4) very gravelly sandy loam, 70 percent pinkish gray (7.5YR 7/2) and 30 percent strong brown (7.5YR 4/6) moist; massive; hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; stratified laminar capping throughout; many distinct calcium carbonate coatings on rock fragments; common fine irregular hard calcium carbonate masses; 54 percent gravel; violently effervescent; 35 percentcalcium carbonate equivalent; moderately alkaline (pH 8.0).

Range in Characteristics

Content of rock fragments: more than 35 percent gravel and cobble
Reaction: slightly alkaline or moderately alkaline
Clay content: 5 to 18 percent
Content of organic matter: 1 to 2 percent
Depth to a petrocalcic horizon: 5 to 18 inches

A horizon
  Hue: 7.5YR, 10YR
  Value: 3 to 5 dry, 2 to 4 moist
  Chroma: 2 or 3 dry, 2 to 4 moist
  Texture: loam, fine sandy loam, sandy loam

Bk horizon
  Hue: 7.5YR, 10YR
  Value: 3 to 5 dry, 2 to 5 moist
  Chroma: 2 to 3 dry, 2 to 4 moist
  Texture: loam, fine sandy loam, sandy loam
  Calcium carbonate equivalent: 5 to 25 percent

2Ck horizon
  Hue: 7.5YR, 10YR
  Value: 5 to 8 dry, 4 to 7 moist
  Chroma: 1 to 4 dry, 2 to 6 moist
  Texture: sandy loam, loamy sand
  Calcium carbonate equivalent: 15 to 40 percent

Schiefflin Series

Depth class: very shallow and shallow
Drainage class: somewhat excessively
Permeability: rapid
Landform: hills
Parent material: slope alluvium and residuum from granodiorite
Slope range: 3 to 15 percent
Elevation: 4000 to 4800 feet
Classification: Mixed, thermic Lithic Torripsamments

Typical Pedon

Schiefflin very stony loamy sand, 3 to 15 percent slopes, located at a latitude of 31 degrees, 43 minutes, 50 seconds North and longitude of 110 degrees, 06 minutes, 25 seconds West; 1925 feet east and 490 feet north from the southwest corner of section 33, Township 19 S., Range 22 E.

A--0 to 6 inches; brown to dark brown (7.5YR 4/3) very stony loamy sand, dark brown (7.5YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; 30 percent stones, 10 percent boulders and 7 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

C--6 to 18 inches; brown to dark brown (7.5YR 4/3) gravelly sand, dark brown (7.5YR 3/2) moist; massive; hard, very friable, nonsticky and nonplastic; common very fine roots; common fine interstitial pores; 20 percent gravel; noneffervescent; moderately acid (pH 5.6); abrupt smooth boundary.

R--18 inches; granodiorite.

Range in Characteristics

Surface rock fragments: 5 to 10 percent boulders, 30 to 40 percent stones, 5 to 10 percent gravel
Rock fragments: 10 to 25 percent gravel
Reaction: moderately acid to neutral
Clay content: 3 to 10 percent
Effervescence: none; some pedons effervesce at the lithic contact
Depth to bedrock: 5 to 20 inches
Stone class: 2
Organic matter: 1 to 3 percent

A and C horizons
  Hue: 7.5YR, 10YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 2 or 3, dry or moist
  Texture: loamy sand, sand

Stronghold Series

Depth class: very deep
Drainage class: well
Permeability: moderately rapid
Landform: fan terraces
Parent material: mixed calcareous fan alluvium
Slope range: 3 to 30 percent
Elevation: 4500 to 5200 feet
Classification: Coarse-loamy, mixed, thermic Ustollic Calciorthids

Typical Pedon

Stronghold very gravelly loamy sand in an area of McAllister - Stronghold complex, 3 to 8 percent slopes, located at a latitude of 31 degrees, 44 minutes, 36 seconds North and longitude of 110 degrees, 01 minutes, 00 seconds West; 2230 feet west and 390 feet south from the northwest corner of section 32, Township 19 S., Range 23 E.

A--0 to 1 inch; brown to dark brown (7.5YR 4/2) very gravelly loamy sand, dark brown (7.5YR 3/2) moist; weak thick platy structure; loose, nonsticky and nonplastic; few very fine roots; common fine interstitial pores; 37 percent gravel; strongly effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--1 to 8 inches; brown to dark brown (7.5YR 4/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, sticky and plastic; common very fine and fine roots; few fine tubular pores; few patchy calcium carbonate coatings on rock fragments; common distinct organic coatings on rock fragments; 34 percent gravel; violently effervescent, 14 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2--8 to 25 inches; light brown (7.5YR 6/3) gravelly sandy loam; brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and plastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; common fine and medium calcium carbonate filaments; 23 percent gravel; violently effervescent, 20 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk3--25 to 60 inches; light brown (7.5YR 6/3) and pink (7.5YR 7/3) gravelly sandy loam, brown to dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; common fine calcium carbonate filaments; horizontal seams of calcium carbonate .5 to 1 inch thick and 12 to 18 inches long; 18 percent gravel; violently effervescent, 18 percent calcium carbonate equivalent; moderately alkaline (pH 8.2).

Range in Characteristics

Surface rock fragments: 35 to 55 percent gravel
Rock fragments: 15 to 35 percent
Reaction: slightly to moderately alkaline
Depth to calcic horizon: 2 to 20 inches
Clay content: 5 to 15 percent
Organic matter: 1 to 2 percent

A horizon
 Hue: 10YR, 7.5YR
 Value: 3 through 5 dry, 2 through 4 moist
 Chroma: 1 through 3, dry or moist
 Texture: fine sandy loam, loam, loamy sand
 Effervescence: slightly to strongly
 Calcium carbonate equivalent: 5 to 15 percent

Bk horizon
 Hue: 10YR, 7.5YR
 Value: 4 through 7 dry, 3 through 5 moist
 Chroma: 2 through 4, dry or moist
 Texture: fine sandy loam, sandy loam, loamy sand
 Effervescence: strongly to violently
 Calcium carbonate equivalent: 14 to 40 percent

Sutherland Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately rapid
Landform: fan terrace
Parent material: mixed calcareous fan alluvium
Slope range: 3 to 15 percent
Elevation: 4000 to 4800 feet
Classification: Loamy-skeletal, carbonatic, thermic, shallow Ustollic Paleorthids.

Typical Pedon

Sutherland gravelly fine sandy loam, 3 to 8 percent slopes, located at a latitude of 31 degrees, 41 minutes, 33 seconds North and longitude of 110 degrees, 02 minutes, 25 seconds West; 1250 feet west and 2380 feet north from the southeast corner of section 18, Township 20 S., Range 22 E.

A--0 to 1 inch; brown (7.5YR 5/3) gravelly fine sandy loam, brown to dark brown (7.5YR 4/3) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine vesicular pores; 28 percent gravel; violently effervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--1 to 8 inches; brown (7.5YR 5/3) very gravelly fine sandy loam, brown to dark brown (7.5YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; common fine interstitial and tubular pores; many distinct calcium carbonate coatings on rock fragments; 37 percent gravel; violently effervescent, 41 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk2--8 to 18 inches; light brown (7.5YR 6/3) very gravelly fine sandy loam, brown (7.5YR 5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 42 percent gravel; violently effervescent, 60 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary.

Bkm--18 to 42 inches; fractured hardpan; extremely hard, strongly cemented by calcium carbonate; weakly to strongly cemented below laminar cap (1/4 to ½ inch thick); violently effervescent; clear smooth boundary.

Ck--42 to 60 inches; pink (7.5YR 7/3) very gravelly sandy loam, light brown (7.5YR 6/3) moist; massive; hard to very hard, firm, nonsticky and nonplastic; few fine roots; weakly cemented by calcium carbonate; violently effervescent.

Range in Characteristics

Surface rock fragments: 35 to 55 gravel and cobble
Rock fragments: greater than 35 percent
Reaction: slightly to moderately alkaline
Depth to hardpan: 5 to 20 inches
Clay content: 5 to 18 percent
Effervescence: strongly or violently
Organic matter: 1 to 3 percent

A horizon
  Hue: 10YR, 7.5YR
  Value: 4 or 5 dry, 3 or 4 moist
  Chroma: 2 through 4, dry or moist
  Texture: fine sandy loam, sandy loam
  Calcium carbonate equivalent: 30 to 45 percent

Bk horizon
  Hue: 10YR, 7.5YR
  Value: 5 or 6 dry, 3 through 6 moist
  Chroma: 2 through 4, dry or moist
  Texture: fine sandy loam, loam, sandy loam
  Calcium carbonate equivalent: 40 to 60 percent

Bkm horizon
  Thickness: 10 to 40 inches

Ck horizon
  Hue: 7.5YR
  Value: 6 or 7, dry or moist
  Chroma: 3 or 4, dry or moist
  Texture: sandy loam, fine sandy loam
Calcium carbonate equivalent: weakly cemented with 45 to 55 percent

Tombstone Series

Depth class: very deep
Drainage class: somewhat excessive
Permeability: moderately rapid
Landform: fan terraces
Parent material: mixed calcareous fan alluvium
Slope range: 8 to 15 percent
Elevation: 4200 to 5000 feet
Classification: Loamy-skeletal, mixed, thermic Ustollic Calciorthids.

Typical Pedon

Tombstone very gravelly fine sandy loam, 8 to 15 percent slopes, located at a latitude of 32 degrees, 44 minutes, 13 seconds North and longitude of 109 degrees, 59 minutes, 50 seconds West; 1310 feet west and 2275 feet north from the southeast corner of section 33, Township 19 S., Range 23 E.

A--0 to 1 inch; grayish brown (10YR 5/2) very gravelly fine sandy loam, dark grayish brown (10YR

4/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; 52 percent gravels; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--1 to 5 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 21 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2--5 to 13 inches; pinkish white (7.5YR 8/2) gravelly sandy loam, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 21 percent gravel; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk3--13 to 27 inches; pinkish gray (7.5YR 7/2) very gravelly sandy loam, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few very fine and fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 47 percent gravel; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); gradual smooth boundary.

Bk4--27 to 60 inches; pinkish gray (7.5YR 6/2) very gravelly loamy sand; brown to dark brown (7.5YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine and fine interstitial and tubular pores; few prominent calcium carbonate coatings on rock fragments; 38 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline (pH 8.0).

Range in Characteristics

Surface rock fragments: 50 to 65 percent gravel and cobble
Rock fragments: averages more than 35 percent
Depth to calcic horizon: 1 to 20 inches
Clay content: 8 to 15 percent
Effervescence: strongly to violently
Calcium carbonate equivalent: 5 to 30 percent
Organic matter: 1 to 2 percent

A horizon
Hue: 10YR, 7.5YR
Value: 4 or 5, dry or moist
Chroma: 2 through 4, dry or moist
Texture: sandy loam, fine sandy loam

Bk horizon
Hue: 10YR, 7.5YR
Value: 3 through 8, dry or moist
Chroma: 2 through 4 dry, 1 through 4 moist
Texture: sandy loam, coarse sandy loam, fine sandy loam, loamy sand

Woodcutter Series

Depth class: very shallow and shallow
Drainage class: well
Permeability: moderately slow
Landform: hills and mountains
Parent material: slope alluvium and residuum from granite and quartz monzonite
Slope range: 15 to 60 percent
Elevation: 5000 to 6200 feet
Classification: Loamy-skeletal, mixed, thermic Lithic Argiustolls

Typical Pedon

Woodcutter gravelly fine sandy loam in an area of Budlamp - Woodcutter complex, 30 to 60 percent slopes, located at a latitude of 31 degrees, 46 minutes, 13 seconds North and longitude of 109 degrees, 53 minutes, 48 seconds West; 1125 feet south and 90 feet east from the northwest corner of section 22, Township 19 S., Range 24 E.

A--0 to 2 inches; dark brown (7.5YR 3/3) gravelly fine sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; common fine interstitial pores; 25 percent gravel; noneffervescent; neutral (pH 6.8); clear smooth boundary.

Bt1--2 to 5 inches; dark reddish brown (5YR 3/3) and dark reddish brown (5YR 2.5/2) very gravelly sandy clay loam, dark reddish brown (5YR 3/2) and black (5YR 2.5/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and slightly plastic; common fine roots; common fine tubular pores; many distinct clay films on rock fragments and on ped faces; 45 percent gravel; noneffervescent; neutral (pH 6.8); abrupt smooth boundary.

Bt1--5 to 14 inches; reddish brown (5YR 5/3) and dark reddish gray (5YR 4/2) very gravelly sandy clay loam, dark reddish brown (5YR 3/3) and dark reddish brown (5YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, sticky and plastic; common fine roots; common fine tubular pores; many distinct clay films on rock fragments and ped faces; many distinct organic coatings on ped faces; 45 percent gravel; noneffervescent; neutral (pH 7.0); abrupt smooth boundary.

2R--14 to 60 inches; granite.

Range in Characteristics

Surface rock fragments: 35 to 50 percent gravel and cobble
Rock fragments: Ranges from 20 to 55 percent gravel; averages more than 35 percent
Reaction: slightly acid or neutral
Clay content: 10 to 35 percent
Organic Matter: 1 to 2 percent
Depth to bedrock: 5 to 20 inches, some pedons have weathered bedrock above the lithic contact.

A horizon
  Hue: 7.5YR, 10YR
  Value: 3 through 5 dry, 2 through 4 moist
  Chroma: 2 through 4, dry or moist
  Texture: fine sandy loam, sandy loam

Bt horizon
  Hue: 7.5YR, 5YR
  Value: 2.5 through 5 dry, 2 through 4 moist
  Chroma: 2 through 6 dry, 1 through 4 moist
  Texture: sandy clay loam, clay loam, loam

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Glossary

1. Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

2. Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

3. Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

4. Alluvial Fan. A low, outspread, relatively flat to gently sloping mass of loose rock material, shaped like an open fan or a segment of a cone, deposited by a stream at the place where it issues from a narrow mountain valley upon a plain or broad valley, or where a tributary stream is near or at its junction with the main stream, or wherever a constriction in a valley abruptly ceases or the gradient of the stream suddenly decreases; it is steeper near the mouth of the valley where its apex points upstream, and it slopes gently and convexly outward with gradually decreasing gradient.

5. Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

6. Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without calf, for 1 month.

7. Argillic Horizon. A subsurface horizon into which clay has moved. It has at about a third more clay than the horizons above. The presence of clay films on ped faces and in soil pores is evidence of clay movement.

8. Available water capacity. The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

9. Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

10. Basin Floor. A general term for the nearly level to gently sloping, bottom surface of an intermountain basin (bolson). Component landforms include playas, broad alluvial flatscontaining ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely if ever are subject to flooding. Where drainage systems are well developed alluvial plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountain ward to distal parts of piedmont slopes.

11. Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

12. Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

13. Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which reduces erosion. Brush management may improve the habitat for some species of wildlife.

14. Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

15. Calcic Horizon. Is a horizon of accumulation of calcium carbonate or of calcium and magnesium carbonate. If the texture of the soil is greater than 18 percent clay the calcic horizon will be more than six inches thick and have more than 15 percent calcium carbonate equivalent and at

least 5 percent more carbonates than the C horizon. If the soil texture is less than 18 percent clay 5 percent calcium carbonate equivalent is required.

16. Calcium Carbonate. Is used interchangeable with lime or limy.

17. Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

18. Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

19. Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

20. Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

21. Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

22. Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

23. Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

24. Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

25. Coarse textured soil. Sand or loamy sand.

26. Cobble. A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

27. Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

28. Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

29. Compressible (in tables). Excessive decrease in volume of soft soil under load.

30. Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

31. Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

    Loose. Noncoherent when dry or moist; does not hold together in a mass.

    Friable. When moist, crushes easily under gently pressure between thumb and forefinger and can be pressed together into a lump.

    Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

    Plastic. When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

    Sticky. When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, breaks into powder or individual grains under very slight pressure.

Cemented. Hard; little affected by moistening.

32. Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

33. Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

34. Crown. The upper part of a tree or shrub, including the living branches and their foliage.

35. Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

36. Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

37. Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

38. Depth Classes. Depth to which the soil is classified.

Very Deep	greater than 60 inches
Deep	40 to 60 inches
Moderately Deep	20 to 40 inches
Shallow	10 to 20 inches
Very Shallow	less than 10 inches

39. Depth to rock (in tables). Bedrock is too near the surface for the specified use.

40. Desert pavement. A layer of gravel or coarser fragments on a desert soil surface that was emplaced by upward movement of fragments from underlying sediment or remains after finer particles have been removed by running water or wind.

41. Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

42. Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

43. Drainage, surface. Runoff, or surface flow of water, from an area.

44. Effervescence. In the field, cold 1N hydrochloric acid is used to test for carbonates. The amount and expression of effervescence is affected by size distribution and mineralogy as well as the amount of carbonates. Consequently, effervescence cannot be used to estimate the amount of carbonate. Four classes of effervescence are used:

noneffervescent - few to none bubbles seen
slightly effervescent - bubbles readily seen
strongly effervescent - bubbles form low foam
violently effervescent - thick foam forms quickly

45. Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

46. Eolian. Pertaining to material transported and deposited by the wind. Includes earth materials such as sand, silt and clay and chemical materials such as calcium carbonate.

47. Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

48. Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

49. Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

50. Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

51. Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

52. Excess salts (in tables). Excess water soluble salts in the soil that restrict the growth of most plants.

53. Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

54. Fan Alluvium. Unconsolidated clastic material deposited on alluvial fans and fan terraces by running water, including gravel, sand, silt, clay and various mixtures of these.

55. Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

56. Fast intake (in tables). The rapid movement of water into the soil.

57. Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and

in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

58. Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

59. Fine textured soil. Sandy clay, silty clay, and clay.

60. Flooding Frequency Classes. None - No reasonable possibility of flooding (near 0 percent chance of flooding in any year). Rare - Flooding unlikely but possible under unusual weather conditions (from near 0 to 5 percent chance or near 0 to 5 times in 100 years). Occasional - Flooding is expected infrequently under usual weather conditions (5 to 50 percent chance of flooding or 5 to 50 times in 100 years). Frequent - Flooding is likely to occur often under usual weather conditions (more than a 50 percent chance of flooding or more than 50 times in 100 years). Common - Occasional and frequent classes can be grouped for certain purposes and called common flooding.

61. Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

62. Forb. Any herbaceous plant not a grass or a sedge.

63. Fragile (in tables). A soil that is easily damaged by use or disturbance.

64. Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

65. Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

66. Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter.

67. Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

68. Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

69. Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

70. Hard rock. Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

71. Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

72. Head out. To form a flower head.

73. Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

74. Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon. An organic layer of fresh and decaying plant residue.

A horizon. The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon. The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon. The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon. Soft, consolidated bedrock beneath the soil.

R layer. Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

75. Hydrologic soil groups. Refers to soils grouped according to their runoff producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

76. Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

77. Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

78. Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

79. Inclusions. Soil components or miscellaneous areas that are not identified in the named map unit. Many areas of these components are too small to be delineated separately or cannot be identified by practical field methods or are deliberately placed in map units to avoid excessive detail on the map or legend. These are two types of inclusions. Similar inclusions are like the named components in characteristics and properties and have the same major interpretations. Contrasting inclusions differ appreciably in one or more properties and the difference generally are great enough to affect major interpretations.

80. Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

81. Induration. The hardening of a soil horizon by chemical action to form a hardpan.

82. Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

83. Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltrationcapacity of the soil or the rate at which water is applied at the surface.

84. Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

	inches per hour
Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

85. Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

86. Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

87. Landform. Any physical, recognizable form or feature of the Earth's surface, having a characteristic shape, and produced by natural causes.

88. Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

89. Leaching. The removal of soluble material from soil or other material by percolating water.

90. Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

91. Lime. Chemically, lime is calcium oxide but, as the term is commonly used it is also calcium carbonate (CaCO3) and calcium hydroxide (Ca(OH)2).

92. Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

93. Low strength. The soil is not strong enough to support loads.

94. Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

95. Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

96. Metamorphic rock. Rock of any origin alteredin mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

97. Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

98. Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation. Examples are rock outcrop and riverwash.

99. Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

100. Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

101. Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

102. Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

103. Munsell notation. A designation of color by degrees of three simple variables=hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

104. Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

105. Nutrient, plant. 1Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

106. Organic matter. Plant and animal residue in the soil in various stages of decomposition.

107. Paleosols. Soils formed in past environments.

108. Parent material. The unconsolidated organic and mineral material in which soil forms.

109. Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

110. Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

111. Percolation. he downward movement of water through the soil.

111. Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

113. Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

	inches per hour
Very slow	less than 0.06
Slow	0.06 to 0.2
Moderately slow	0.2 to 0.6
Moderate	0.6 inch to 2.0
Moderately rapid	2.0 to 6.0
Rapid	6.0 to 20
Very rapid	more than 20

114. Petrocalcic Horizon. A continuous or fractured, cemented or indurated calcic horizon cemented by carbonates and some silica. This is the sameas a lime cemented hardpan or a cemented calcium carbonate hardpan.

115. Phase, soil. A subdivision of a soil series basedon features that affect its use and management. For example, slope, stoniness, and thickness.

116. pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

117. Piping (in tables). Formation of subsurface tunnels or pipe like cavities by water moving through the soil.

118. Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

119. Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

120. Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

121. Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

122. Potential rooting depth (effective rootingdepth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

123. Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

124. Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

125. Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

126. Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

127. Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

128. Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

129. Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

130. Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

131. Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

132. Relief. The elevations or inequalities of a land surface, considered collectively.

133. Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

134. Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

135. Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, gravel, cobble, stones, and boulders. Surface rock fragments were visually estimated at each soil pit location and recorded as the percent rock fragments on the surface, not the percent of the ground covered by rock fragments. Rock fragments within the soil profile were measured volumetrically at each soil pit for each soil horizon and converted to a weight percentage in the tables.

136. Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

137. Root zone. The part of the soil that can be penetrated by plant roots.

138. Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

139. Runoff. Runoff of water from a soil is determined by the percent slopes and the hydrologic soil group.

Hydrologic	Percent Slope			
Group	0 - 3	3 - 15	15 - 30	30+
A	v slow	v slow	slow	slow
B	slow	medium	rapid	rapid
C	slow	medium	rapid	rapid
D	medium	med/rapid	v rapid	v rapid

140. Salty water (in tables.) Water that is too salty for consumption by livestock.

141. Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

142. Sandstone. Sedimentary rock containing dominantly sand-sized particles.

143. Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

144. Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

145. Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

146. Shale. Sedimentary rock formed by the hardening of a clay deposit.

147. Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

148. Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

149. Shrub-comppice dune. A small, streamline dune that forms around brush and clump vegetation.

150. Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

151. Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

152. Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

153. Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

154. Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

155. Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

156. Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	<u>Percent</u>
Nearly level	0 to 3
Gently sloping or undulatin	3 to 7
Strongly sloping or rolling	7 to 15
Moderately steep or hilly	15 to 25
Steep	25 to 55
Very steep	55 +

157. Slope Alluvium. Sediment gradually transported on mountain or hill slopes primarily by alluvial processes and characterized by particle sorting. To a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated

by stone lines. Sorting of rounded or subrounded gravel or cobble, and buried peds contrast with unsorted colluvial deposits.

158. Slow intake (in tables). The slow movement of water into the soil.

159. Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

160. Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

161. Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

162. Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

163. Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

164. Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

165. Stone Class. Rock fragments on the surface of a soil, including both those that lie on the surface and those that are partly within the soil but protrude above ground. The limitations they impose are related to their number, size, and spacing at the surface. The class limits that follow are given in terms of the approximate amount of stones and boulders at the surface.

Class 1 - Any stones or boulders cover less than 0.01 percent of the surface. Stones of the smallest sizes are at least 25 meters apart; boulders of the smallest size are at least 60 meters apart.

Class 2 - Stones or boulders cover about 0.01 to 0.1 percent of the surface. Stones of the smallest sizes are no less than 8 meters apart; boulders of the smallest size are no less than 20 meters apart.

Class 3 - Stones or boulders cover about 0.1 to 3 percent of the surface. Stones of the smallest sizes are no less than 1 meters apart; boulders of the smallest size are no less than 3 meters apart.

Class 4 - Stones or boulders cover about 3 to 15 percent of the surface. Stones of the smallest sizes are as little as 0.5 meters apart; boulders of the smallest size are as little as 1 meters apart.

Class 5 - Stones or boulders cover about 15 to 50 percent of the surface and are so closely spaced that in most places it is possible to step from stone to stone or jump from boulder to boulder without touching the soil. Stones of the smallest sizes are as little as 0.1 meters apart; boulders of the smallest size are as little as 0.2 meters apart.

Class 6 - Stones or boulders appear to be nearly continuous and cover more than 50 percent of the surface. The distant between fragments are measured in centimeter or decimeters in most places. Classifiable soil is among the rubble, and plants can grow if moisture and nutrients are available.

Class 7 - Stones or boulders cover more than 50 percent of the surface, and so little earthy material is between the stones or boulders that few plants other than lichens can grow even though other factors are favorable. The deposits are not classifiable as soil and are mapped as "rubble land".

166. Stream Alluvium. Unconsolidated clastic material deposited on stream terraces by running water, including gravel, sand, silt, clay and various mixtures of these.

167. Stream Terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the dissected remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of erosion or deposition.

168. Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

169. Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

170. Substratum. The part of the soil below the solum.

171. Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

172. Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

173. Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

174. Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

175. Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

176. Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

177. Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

177. Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

179. Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

180. Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

181. Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

182. Water Erosion Classes. Water erosion is determined by the soil erodibility factor (K factor) of the soil's surface texture and percent slope. The K factor is a measure of the susceptibility of a soil to particle detachment and transport by rainfall. It is a quantitative value, experimentally determined.

	Percent Slope			
K factor	0 - 3	3 - 15	15 - 30	30 +
0.02 - 0.20	slight	slight	moderate	severe
0.24 - 0.37	slight	moderate	severe	severe
0.43 - 0.69	moderate	severe	severe	v severe

183. Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

184. Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

185. Wind Erodibility Group. A wind erodibility group (WEG) is a collection of soils that have similar properties affection their resistance to soil blowing. The groups indicate the susceptibility to blowing. The lower the number the more susceptible the soil is to wind erosion.

Erosion	WEG
very high	1
high	2
moderately high	3
moderate	4, 4L
slight	5 - 7
very slight	8

Index to Map Units

Symbol	Soil Map Unit Names
1	Baboquivari - Combate complex, 0 to 3 percent slopes
2	Blacktail gravelly sandy loam, 8 to 15 percent slopes
3	Budlamp - Woodcutter complex, 30 to 60 percent slopes
4	Chiricahua very gravelly clay loam, 8 to 15 percent slopes
5	Combate loamy sand, 0 to 3 percent slopes
6	Elgin - Stronghold complex, 8 to 15 percent slopes
7	Epitaph very cobbly clay loam, 3 to 15 percent slopes
8	Forrest - Bonita complex, 0 to 3 percent slopes
9	Graham cobbly clay loam, 8 to 15 percent slopes
10	Graham - Lampshire complex, 15 to 30 percent slopes
11	Grizzle coarse sandy loam, 3 to 8 percent slopes
12	Lampshire - Rock outcrop complex, 3 to 15 percent slopes
13	Lampshire - Rock outcrop complex, 15 to 60 percent slopes
14	Luckyhills loamy sand, 0 to 3 percent slopes
15	Luckyhills - McNeal complex, 3 to 8 percent slopes
16	Luckyhills - McNeal complex, 8 to 15 percent slopes
17	Mabray - Chiricahua - Rock outcrop complex, 3 to 15 percent slopes
18	Mabray - Chiricahua - Rock outcrop complex, 15 to 30 percent slopes
19	Mabray - Rock outcrop complex, 3 to 15 percent slopes
20	Mabray - Rock outcrop complex, 15 to 45 percent slopes
21	McAllister - Stronghold complex, 3 to 8 percent slopes
22	Pedgregosa very gravelly fine sandy loam, 3 to 8 percent slopes
23	Pedregosa very gravelly fine sandy loam, 8 to 15 percent slopes
24	Riverwash - Bodecker complex, 0 to 3 percent slopes
25	Schiefflin very stony loamy sand, 3 to 15 percent slopes
26	Stronghold - Bernardino complex, 10 to 30 percent slopes
27	Sutherland - Mule complex, 8 to 15 percent slopes
28	Sutherland very gravelly fine sandy loam, 3 to 8 percent slopes
29	Tombstone very gravelly fine sandy loam, 8 to 15 percent slopes
30	Woodcutter gravelly sandy loam, 15 to 30 percent slopes

Tables

Table 1 Temperature and Precipitation

TOMBSTONE
Start yr. - 1900 End yr. - 1993
Temperature: 94 years available out of 94 requested in this analysis
Precipitation: 94 years available out of 94 requested in this analysis

	Temperature (Degrees F.)						Precipitation (Inches)				
Month				2 yrs in 10 will have		avg # of grow deg days*	avg	2 yrs in 10 will have		avg # of days w/.1 or more	avg total snow fall
	avg daily max	ave daily min	ave	max temp. >than	min temp. <than			less than	more than		
January	59.9	34.5	47.2	77	17	242	0.93	0.27	1.60	2	0.9
February	63.5	36.7	50.1	80	21	291	0.79	0.30	1.40	2	0.5
March	68.8	40.2	54.5	85	24	448	0.66	0.16	1.22	1	0.3
April	77.1	46.2	61.6	91	30	648	0.27	0.10	0.62	0	0.0
May	85.1	53.5	69.3	98	38	906	0.21	0.07	0.54	0	0.0
June	94.4	62.1	78.2	105	48	1145	0.48	0.14	1.07	1	0.0
July	93.0	65.5	79.3	104	57	1209	3.50	1.93	4.89	7	0.0
August	90.2	64.1	77.1	101	57	1148	3.33	1.90	4.60	7	0.0
September	87.7	60.3	74.0	99	49	1012	1.49	0.45	2.43	3	0.0
October	79.5	51.4	65.4	93	34	786	0.82	0.23	1.56	1	0.0
November	68.4	41.3	54.9	84	25	447	0.62	0.15	1.22	1	0.2
December	60.3	25.4	47.8	77	19	256	0.92	0.27	1.65	2	0.7
Yearly:											
Average	77.3	49.3	63.3	----	—	----	-----	-----	-----	—	----
Extreme	112	3	-----	107	15	----	-----	-----	-----	—	----
Total	-----	-----	-----	-----	—	8537	14.02	9.52	17.06	27	2.7

Average # of days per year with at least 1 inch of snow on the ground: 0

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold : 40.4 deg. F).

Table 2 Freeze Dates in Spring and Fall

TOMBSTONE

Start yr. - 1900 End yr. - 1993
Requested years of data: 94 Available years of data: 94
Spring:
Years of missing data 24 deg = 10, 28 deg = 9, 32 deg = 8
Years with no occurrence 24 deg = 12, 28 deg = 1, 32 deg = 0
Data years used 24 deg = 84, 28 deg = 85, 32 deg = 86
Fall:
Years of missing data 24 deg = 12, 28 deg = 12, 32 deg = 9
Years with no occurrence 24 deg = 5, 28 deg = 0, 32 deg = 0
Data years used 24 deg = 82, 28 deg = 82, 32 deg = 85

	Temperature		
Probability	24F or lower	28F or lower	32F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 6	April 2	April 20
2 year in 10 later than--	February 23	March 22	April 12
5 year in 10 later than--	January 30	March 1	March 28
First freezing temperature in fall:			
1 year in 10 earlier than--	November 23	November 9	October 29
2 year in 10 earlier than--	December 5	November 17	November 5
5 year in 10 earlier than--	December 30	December 2	November 17

Table 3 Growing Season

TOMBSTONE

Start yr. - 1900 End yr. - 1993
Requested years of data: 94 Available years of data: 94
Years of missing data
Years with no occurrence 24 deg = 20, 28 deg = 17, 32 deg = 14
Data years used 24 deg = 7, 28 deg = 0, 32 deg = 0
24 deg = 74, 28 deg = 77, 32 deg = 80

	Daily Minimum Temperature		
Probability	# days > 24F	# days > 28F	# days > 32F
9 years in 10	279	233	203
8 years in 10	299	247	214
5 years in 10	343	273	235
2 years in 10	> 365	300	256
1 year in 10	> 365	314	267

Table 4 Acreage and Proportionate Extent of the Soils

Map Symbol	Soil Name	Acres	Percent
1	Baboquivari-Combate complex, 0 to 3 percent slopes	1,024	2.8
2	Blacktail gravelly sandy loam, 8 to 5 percent slopes	585	.6
3	Budlamp-Wooductter complex, 30 to 60 percent slopes	48	0.4
4	Chiricahua very gravelly clay loam, 8 to 5 percent slopes	45	0.4
5	Combate loamy sand, 0 to 3 percent slopes	47	0.4
6	Elgin-Stronghold complex, 8 to 5 percent slopes	4,058	11.1
7	Epitaph very cobbly loam, 3 to 5 percent slopes	622	.7
8	Forrest-Bonita complex, 0 to 3 percent slopes	366	1.0
9	Graham cobbly clay loam, 8 to 5 percent slopes	695	.9
10	Graham-Lampshire complex, 5 to 30 percent slopes	658	.8
11	Grizzle coarse sandy loam, 3 to 8 percent slopes	256	0.7
12	Lampshire-Rock outcrop complex, 3 to 5 percent slopes	329	0.9
13	Lampshire-Rock outcrop complex, 5 to 60 percent slopes	366	1.0
14	Luckyhills loamy sand, 0 to 3 percent slopes	73	0.2
15	Luckyhills -McNeal complex, 3 to 8 percent slopes	4,972	13.6
16	Luckyhills-McNeal complex, 8 to 15 percent slopes	4,570	12.5
17	Mabray-Chiricahua-Rock outcrop complex, 3 to 15 percent slopes	877	2.4
18	Mabray-Chiricahua-Rock outcrop complex, 15 to 30 percent slopes	58	1.5
19	Mabray-Rock outcrop complex, 3 to 15 percent slopes	878	2.4
20	Mabray-Rock outcrop complex, 15 to 5 percent slopes	1,426	3.9
21	McAllister-Stronghold complex, 3 to 8 percent slopes	3,510	9.6
22	Pedregosa very gravelly find sandy loam, 3 to 8 percent slopes	585	1.6
23	Pedregosa very gravelly find sandy loam, 8 to 15 percent slopes	146	0.4
24	Riverwash-Bodecker complex, 0 to 3 percent slopes	475	1.3
25	Schiefflin very stony loamy sand, 3 to 15 percent slopes	768	2.1
26	Stronghold-Bernardino complex, 10 to 30 percent slopes	2,157	5.9
27	Sutherland-Mule complex, 8 to 15 percent slopes	1,938	5.3
28	Sutherland very gravelly find sandy loam, 3 to 8 percent slopes	1,645	4.5
29	Tombstone very gravelly fine sandy loam, 8 to 15 percent slopes	2,376	6.5
30	Woodcutter gravelly sandy loam, 15 to 30 percent slopes	219	0.6
	Total	36,562	100.0

Table 5. Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Compo- sition
		Kind of year	Dry weight		
			Lb/acre		Pct
1*:					
Baboquivari	Loamy Upland, 12-16" P.z.	Favorable	1,500	Arizona cottontop	5
		Normal	1,000	Black grama	10
		Unfavorable	650	Sideoats grama	8
				Cane beardgrass	5
				Bush muhly	5
				Plains bristlegrass	5
				Fluffgrass	2
				Other perennial grasses	25
				Range ratany	5
				rocky mountain zinnia	5
				Shrubby buckwheat	5
				Other annual forbs	15
				Other shrubs	5
Combate	Sandy Loam (deep), 12-16" P.z.	Favorable	1,000	Arizona cottontop	20
		Normal	800	Black grama	10
		Unfavorable	600	Bush muhly	5
				Plains bristlegrass	5
				Rothrock grama	5
				Other perennial grasses	10
				Other annual forbs	10
				Mesquite	10
				Whitethorn	5
				Other shrubs	5
				Sideoats grama	15
2	Loamy Upland, 16-20" P.z.	Favorable	2,500	Plains lovegrass	10
Blacktail		Normal	1,800	Texas bluestem	10
		Unfavorable	1,000	Sideoats grama	10
				Crinkleawn	10
				Beggartickgrass	5
				Cane beardgrass	5
				Green sprangletop	5
				Other perennial grasses	5
				Other perennial forbs	10
				Falsemesquite	5
				Yerba de pasmo	5
				Palmer agave	5
				Other shrubs	5
				Wheeler sotol	5
				Velvet-pod mimosa	5

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Compo-sition
		Kind of year	Dry weight		
			Lb/acre		Pct
3*:					
Budlamp	Shallow Hills, 16-20" P.z.	Favorable	1,500	Texas bluestem	10
		Normal	1,000	Plains lovegrass	10
		Unfavorable	750	Sideoats grama	10
				Bullgrass	10
				Beggartickgrass	5
				Green sprangletop	5
				Prairie junegrass	5
				Sedge	5
				Other perennial grasses	5
				Other perennial forbs	10
				Coulter brickellbush	5
				Coralbean	5
				Other shrubs	5
				Sotol	5
				Palmer agave	5
Woodcutter	Shallow Hills, 16-20" P.z.	Favorable	1,500	Texas bluestem	10
		Normal	1,200	Bullgrass	15
		Unfavorable	900	Plains lovegrass	10
				Sideoats grama	10
				Beggartickgrass	5
				Green Sprangletop	5
				Sedge	5
				Other perennial grasses	5
				Other perennial forbs	15
				Sacahuista	5
				Other shrubs	10
				Palmer agave	5
4 Chiricahua	Shallow Upland, 12-16" P.z.	Favorable	750	Hairy grama	10
		Normal	600	Sideoats grama	15
		Unfavorable	450	Black grama	10
				Cane beardgrass	5
				Slender grama	5
				Threeawn	5
				Plains lovegrass	5
				Plains bristlegrass	5
				Arizona cottontop	5
				Falsemesquite	10
				Curlymesquite	10
				Shrubby buckwheat	5
				Other shrubs	10

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Compo-sition
		Kind of year	Dry weight		
			Lb/acre		Pct
5 Combate	Sandy Loam, (deep), 12-16" P.z.	Favorable	1,000	Arizona cottontop	20
		Normal	800	Black grama	10
		Unfavorable	600	Bush muhly	5
				Plains bristlegrass	5
				Rothrock grama	5
				Other perennial grasses	10
				Other annual forbs	10
				Mesquite	10
				Whitethorn	5
				Other shrubs	5
				Sideoats grama	15
6*: Elgin	Loamy Upland, 12-16" P.z.	Favorable	1,500	Sideoats grama	15
		Normal	1,000	Cane beardgrass	5
		Unfavorable	700	Plains bristlegrass	5
				Plains lovegrass	20
				Prairie junegrass	5
				Green sprangletop	5
				Hairy grama	8
				Curlymesquite	7
				Vine mesquite	5
				Shrubby buckwheat	5
				Range ratany	5
				Falsemesquite	5
				Other annual forbs	10
Stronghold	Limy Slopes, 12-16" P.z.	Favorable	1,500	Sideoats grama	15
		Normal	900	Black grama	20
		Unfavorable	600	Cane beardgrass	5
				Blue threeawn	5
				Red threeawn	5
				New mexico feathergrass	5
				Hairy grama	5
				Curlymesquite	5
				Falsemesquite	15
				Longleaf mormon tea	8
				Yucca	2
				Other annual forbs	10

See footnote at end of table.

*see

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
7 Epitaph	Clayey Upland, 12-16" P.z.	Favorable	1,200	Sideoats grama	15
		Normal	850	Plans lovegrass	10
		Unfavorable	500	Tobosa	5
				Vine mesquite	5
				Blue grama	12
				Curlymesquite	10
				Bush muhly	5
				Black grama	13
				Falsemesquite	5
				Shrubby buckwheat	5
				Winterfat	2
				Cactus	1
				Staghorn cholla	1
				Soaptree yucca	1
				Cane beardgrass	10
8*: Forrest	Loamy Bottom, (swales), 12-16" P.z.	Favorable	3,000	Blue grama	25
		Normal	2,000	Vine mesquite	20
		Unfavorable	1,000	Sideoats grama	10
				Cane beardgrass	5
				Tobosa	5
				Giant sacaton	5
				Other annual forbs	10
				Cactus	3
				Yucca	5
				Other perennial grasses	12
8*: Bonita	Clayey Bottom, 12-16" P.z.	Favorable	2,500	Tobosa	55
		Normal	2,000	Sideoats grama	20
		Unfavorable	800	Cane beardgrass	5
				Blue grama	10
				Red threeawn	3
				Curlymesquite	2
				Soaptree yucca	1
				Mesquite	2
				Whitethorn	1
				Broom snakeweed	1

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production Kind of year	Total production Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
9 Graham	Clayey Upland, 12-16" P.z.	Favorable	900	Sideoats grama	25
		Normal	750	Cane beardgrass	10
		Unfavorable	500	Tobosa	10
				Other perennial grasses	5
				Other perennial forbs	5
				Yerba de pasmo	5
				Black Grama	15
				Curlymesquite	5
				Threeawn	5
				Fourwing saltbush	5
				Plains lovegrass	5
				Falsemesquite	5
10*:					
Graham	Basalt Hills, 12-16" P.z.	Favorable	900	Sideoats grama	25
		Normal	750	Cane beardgrass	10
		Unfavorable	500	Tobosa	10
				Other perennial grasses	5
				Other perennial forbs	5
				Yerba de pasmo	5
				Black Grama	15
				Curlymesquite	5
				Threeawn	5
				Fourwing saltbush	5
				Plants lovegrass	5
				Falsemesquite	5
Lampshire	Granitic Hills, 12-16" P.z.	Favorable	1,250	Hairy grama	10
		Normal	900	Sideoats grama	20
		Unfavorable	600	Black grama	10
				Cane beardgrass	10
				Slender grama	5
				Threeawn	5
				Plains lovegrass	10
				Bullgrass	5
				Plains bristlegrass	5
				Wooly bunchgrass	5
				Arizona cottontop	5
				Falsemesquite	5
				Other shrubs	5

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
11 Grizzle	Limy Upland, 12-16" P.z.	Favorable	900	Black grama	10
		Normal	600	Bush muhly	15
		Unfavorable	350	Spike dropseed	3
				Plains bristlegrass	5
				Desert Zinnia	15
				Creosotebush	10
				Whitethorn	3
				Tarbush	7
				Other shrubs	5
				Other annual forbs	10
				Fluffgrass	2
				Texas dogweed	10
				Knifeleaf condalia	5
12*:					
Lampshire	Shallow Upland, 12-16" P.z.	Favorable	1,200	Hairy grama	10
		Normal	850	Sideoats grama	20
		Unfavorable	550	Black grama	10
				Cane beardgrass	10
				Slender grama	5
				Threeawn	5
				Plains lovegrass	10
				Bullgrass	5
				Plains bristlegrass	5
				Wooly bunchgrass	5
				Arizona cottontop	5
				Falsemesquite	5
				Other shrubs	5

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Rock outcrop.					
13*:	Granitic Hills, 12-16" P.z.	Favorable	1,250	Hairy grama	10
Lampshire		Normal	900	Sideoats grama	20
Epitaph		Unfavorable	600	Black grama	10
				Cane beardgrass	10
				Slender grama	5
				Threeawn	5
				Plains lovegrass	10
				Bullgrass	5
				Plains bristlegrass	5
				Wooly bunchgrass	5
				Arizona cottontop	5
				Falsemesquite	5
				Other shrubs	5
				Soaptree yucca	1
				Cane beardgrass	1
					10
Rock outcrop.	Limy Upland, 12-16" P.z.	Favorable	800	Bush muhly	10
14		Normal	500	Fluffgrass	5
Luckyhills		Unfavorable	300	Slim tridens	5
				Other annual forbs	5
				Creosotebush	15
				Whitethorn	15
				Desert zinnia	15
				Mariola	5
				Tarbush	10
				Ratear coldenia	5
				Black grama	5
				Sand dropseed	2
				Javelina brush	3

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
15*, 16*:					
Luckyhills	Limy Upland, 12-16 P.z.	Favorable	800	Bush muhly	10
		Normal	500	Fluffgrass	5
		Unfavorable	300	Slim tridens	5
				Other annual forbs	5
				Creosotebush	15
				Whitethorn	15
				Desert zinnia	15
				Mariola	5
				Tarbush	10
				Ratear coldenia	5
				Black grama	5
				Sand dropseed	2
				Javelina brush	3
McNeal	Limy Upland, 12-16 P.z.	Favorable	900	Black grama	20
		Normal	600	Bush muhly	10
		Unfavorable	350	Plains bristlegrass	10
				Sideoats grama	5
				Blue threeawn	10
				Other annual forbs	10
				Desert zinnia	5
				Creosotebush	5
				Whitethorn	5
				Tarbush	5
				Mariola	5
				Range ratany	5
				Other shrubs	5
17*					
Mabray	Limestone Hills, 12-16" P.z.	Favorable	1,600	Sideoats grama	20
		Normal	900	Black grama	10
		Unfavorable	300	Cane beardgrass	10
				Threeawn	5
				Slim tridens	10
				Plains bristlegrass	10
				Green sprangletop	5
				Bush muhly	5
				Arizona cottontop	5
				Ratany	5
				Mariola	5
				Sacahuista	5
				Ocotillo	5

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Chiricahua	Shallow Upland, 12-16" P.z.	Favorable	750	Hairy grama	10
		Normal	600	Sideoats grama	15
		Unfavorable	50	Black grama	10
				Cane beardgrass	5
				Slender grama	5
				Threeawn	5
				Plains lovegrass	5
				Plains bristlegrass	5
				Arizona cottontop	5
				Falsemesquite	10
				Curlymesquite	10
				Shrubby buckwheat	5
				Other shrubs	10
18* Mabray	Limestone Hills, 12-16" P.z.	Favorable	1,600	Sideoats grama	20
		Normal	900	Black grama	10
		Unfavorable	300	Cane beardgrass	10
				Threeawn	5
				Slim tridens	10
				Plains bristlegrass	10
				Green sprangletop	5
				Bush muhly	5
				Arizona cottontop	5
				Ratany	5
				Mariola	5
				Sacahuista	5
				Ocotillo	5
Chiricahua	Shallow Upland, 12-16" P.z.	Favorable	750	Hairy grama	10
		Normal	600	Sideoats grama	15
		Unfavorable	450	Black grama	10
				Cane beardgrass	5
				Slender grama	5
				Threeawn	5
				Plains lovegrass	5
				Plains bristlegrass	5
				Arizona cottontop	5
				Falsemesquite	10
				Curlymesquite	10
				Shrubby buckwheat	5
				Other shrubs	10

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Compo-sition
		Kind of year	Dry weight		
			Lb/acre		Pct
Rock outcrop.					
19*, 20*:					
Mabray	Limestone Hills, 12-16" P.z.	Favorable	1,600	Sideoats grama	20
		Normal	900	Black grama	10
		Unfavorable	300	Cane beardgrass	10
				Threeawn	5
				Slim tridens	10
				Plains bristlegrass	10
				Green sprangletop	5
				Bush muhly	5
				Arizona cottontop	5
				Ratany	5
				Mariola	5
				Sacahuista	5
				Ocotillo	5
Rock outcrop.					
21*:					
McAllister	Loamy Upland, 12-16" P.z.	Favorable	1,500	Sideoats grama	15
		Normal	1,000	Plains lovegrass	15
		Unfavorable	650	Cane beardgrass	8
				Black grama	7
				Blue grama	5
				Curlymesquite	5
				Other annual forbs	10
				Falsemesquite	5
				Shrubby buckwheat	5
				Longleaf mormon tea	3
				Rock mountain zinnia	2
				Other shrubs	5
				Other perennial grasses	15
Stronghold	Limy Slopes, 12-16" P.z.	Favorable	1,500	Sideoats grama	15
		Normal	900	Black grama	20
		Unfavorable	600	Cane beardgrass	5
				Blue threeawn	5
				Red threeawn	5
				New mexico feathergrass	5
				Hairy grama	5
				Curlymesquite	5
				Falsemesquite	15
				Longleaf mormon tea	8
				Yucca	2
				Other annual forbs	10

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
22, 23 Pedregosa	Limy Upland, 12-16" P.z.	Favorable	900	Littleleaf sumac	5
		Normal	600	Whitethorn	10
		Unfavorable	300	Creosotebush	10
				Mariola	10
				Desert zinnia	10
				Tarbush	5
				Range ratany	5
				Bush muhly	10
				Black grama	10
				Fluffgrass	2
				Desert needlegrass	3
				Sideoats grama	5
				Cane beardgrass	5
				Blue threeawn	5
				Javelina brush	5
24*: Riverwash. Bodecker	Sandy Bottom, 12-16" P.z.	Favorable	3,000	Sideoats grama	10
		Normal	2,000	Spike dropseed	5
		Unfavorable	1,000	Green sprangletop	2
				Cane beardgrass	3
				Plains bristlegrass	5
				Other perennial grasses	20
				Arizona walnut	2
				Mesquite	20
				Catclaw acacia	8
				Desertwillow	5
				Netleaf hackberry	3
				Other shrubs	10
				Other annual forbs	

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
25 Schiefflin	Sandy Loam (deep), 12-16" P.z.	Favorable	1,600	Sideoats grama	27
		Normal	900	Plains lovegrass	10
		Unfavorable	600	Cane beardgrass	5
				Bullgrass	2
				Black grama	10
				Bush muhly	5
				Arizona cottontop	5
				Wright lippia	5
				Littleleaf sumac	5
				Palmer agave	1
				Range ratany	5
				Falsemesquite	5
				Shrubby buckwheat	5
				Whitethorn	5
26*: Stronghold	Limy Slopes, 12-16" P.z.	Favorable	1,500	Sideoats grama	15
		Normal	900	Black grama	20
		Unfavorable	600	Cane beardgrass	5
				Blue threeawn	5
				Red threeawn	5
				New mexico feathergrass	5
				Hairy grama	5
				Curlymesquite	5
				Falsemesquite	15
				Longleaf mormon tea	8
				Yucca	2
				Other annual forbs	10
Bernardino	Loamy Upland, 12-15" P.z.	Favorable	1,200	Sideoats grama	20
		Normal	850	Cane beardgrass	5
		Unfavorable	500	Plains lovegrass	10
				Curlymesquite	10
				Hairy grama	10
				Black grama	10
				Falsemesquite	5
				Shrubby buckwheat	5
				Longleaf mormon tea	5
				Other perennial grasses	20

See footnote at end of table.

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production Kind of year	Total production Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
27*:					
Sutherland	Limy Upland 12-16" P.z.	Favorable	600	Whitethorn	10
		Normal	400	Desert zinnia	10
		Unfavorable	200	Mariola	10
				Ratear coldenia	5
				Tarbush	5
				Littleleaf sumac	3
				Creosotebush	5
				Bush muhly	10
				Black grama	10
				Plains bristlegrass	5
				Desert needlegrass	3
				Other perennial grasses	12
				Sandpaper plant	10
				Javelina brush	2
27*:					
Mule	Limy Upland, 12-16" P.z.	Favorable	600	Whitethorn	7
		Normal	400	Desert zinnia	10
		Unfavorable	200	Mariola	5
				Tarbush	5
				Allthorn	5
				Creosotebush	10
				Black grama	10
				Bush muhly	10
				Slim tridens	5
				Desert needlegrass	3
				Sideoats grama	5
				Other shrubs	15
				Sandpaper plant	10
28	Limy Upland, 12-16" P.z.	Favorable	600	Whitethorn	10
Sutherland		Normal	400	Desert Zinnia	10
		Unfavorable	200	Mariola	10
				Ratear coldenia	5
				Tarbush	5
				Littleleaf sumac	3
				Creosotebush	5
				Bush muhly	10
				Black grama	10
				Plains bristlegrass	5
				Desert needlegrass	3
				Other perennial grasses	12
				Sandpaper plant	10
				Javelina brush	2

Table 5. Rangeland Productivity and Characteristic Plant Communities -- Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
29 Tombstone	Limy Upland, 12-16" P.z.	Favorable	800	Littleleaf sumac	15
		Normal	600	Desert zinnia	15
		Unfavorable	400	Sacahuista	10
				Mariola	10
				Whitethorn	10
				Black grama	10
				Bush muhly	10
				Desert needlegrass	5
				Slim tridens	5
				Sideoats grama	5
				Texas dogweed	5
30 Woodcutter	Shallow Hills, 16-20" P.z.	Favorable	1,500	Texas bluestem	10
		Normal	1,200	Bullgrass	15
		Unfavorable	900	Plains lovegrass	10
				Sideoats grama	10
				Beggartickgrass	5
				Green Sprangletop	5
				Sedge	5
				Other perennial grasses	5
				Other perennial forbs	15
				Sacahuista	5
				Other shrubs	10
				Palmer agave	5

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6. RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for deviations of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1*:					
Baboquivari	Slight:	Slight:	Moderate: slope, small stones.	Slight:	Moderate: droughty.
Combate	Severe: flooding.	Moderate: too sandy, small stones.	Severe: small stones	Moderate: too sandy	Moderate: small stones, droughty.
2 Blacktail	Moderate: slope, small stones.	Moderate: slope, small stones	Severe: slope, small stones.	Slight:	Moderate: small stones, droughty, slope.
3*:					
Budlamp	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Budlamp	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Woodcutter	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
4 Chiricahua	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe:	Severe: small stones.
5 Combate	Severe: flooding.	Moderate: too sandy, small stones.	Severe: small stones.	Moderate: too sandy.	Moderate: small stones, droughty.
6*:					
Elgin	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Stronghold	Severe: small stones.	Severe: small stones.	Severe: slope small stones.	Severe: small stones.	Severe: small stones, droughty.

See footnote at end of table.

TABLE 6. RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
8*:					
Forrest	Slight:	Slight:	Moderate: slope, small stones.	Slight:	Slight:
8*:					
Bonita	Severe: flooding.	Moderate: dusty.	Moderate: flooding, dusty.	Moderate: dusty.	Moderate: flooding.
9 Graham	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.	Severe: large stones, depth to rock.
10*:					
Graham	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones.	Severe: large stones, slope, depth to rock.
Lampshire	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope, depth to rock.
11 Grizzle	Slight:	Slight:	Moderate: slope, small stones, depth to rock.	Slight:	Moderate: depth to rock.
12*:					
Lampshire	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: large stones, slope, depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
14 Luckyhills	Slight:	Slight:	Moderate: small stones.	Slight:	Moderate: droughty.
15*:					
Luckyhills	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight:	Severe: small stones.
McNeal	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight:	Severe: small stones.

See footnote at end of table.

TABLE 6. RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
16*:					
Luckyhills	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight:	Severe: small stones.
16*:					
McNeal	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight:	Severe: small stones.
17*:					
Mabray	Severe: large stones.	Severe: large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Severe: large stones, droughty.
Chiricahua	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe:	Severe: small stones.
18*:					
Mabray	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones	Moderate: large stones, slope.	Severe: large stones, droughty.
Chiricahua	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe:	Severe: small stones, slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
19*:					
Mabray	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, slope, small stones.	Severe: small stones.	Severe: small stones, large stones, droughty.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight:	Severe: depth to rock.
20*:					
Mabray	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, large stones, droughty.

TABLE 6. RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways

See footnote at end of table.

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
21*:					
McAllister	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight:	Moderate: small stones, droughty.
Stronghold	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.
22 Monterosa	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones.	Severe: small stones, cemented pan.
23 Monterosa	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: slope, small stones, cemented pan.	Severe: small stones.	Severe: small stones, cemented pan.
Bodecker	Severe: flooding.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Severe: droughty.
25 Schiefflin	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Moderate: too sandy.	Severe: droughty, depth to rock.
26*:					
Stronghold	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty, slope.
Bernardino	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
27*:					
Sutherland	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: slope, small stones, cemented pan.	Severe: small stones.	Severe: small stones, cemented pan.

TABLE 6. RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Mule	Severe: small stones, excess salt.	Severe: small stones, excess salt.	Severe: slope, small stones, excess salt.	Severe: small stones.	Severe: excess salt, small stones.
28 Sutherland	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones, cemented pan.	Severe: small stones.	Severe: small stones, cemented pan.
29 Tombstone	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty.
30 Woodcutter	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7. ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated.

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
1*:												
Baboquivari	0-1	Sandy loam	SM, SC-SM	A-2, A-4	0	0	90-100	85-95	50-60	25-40	15-20	NP-5
	1-24	Loam, sandy clay loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	0	90-100	85-95	70-80	40-60	20-35	5-15
	24-34	Sandy loam	SM, SC-SM	A-2, A-R	0	0	90-100	85-95	50-60	25-40	15-20	NP-5
	34-60	Coarse sandy loam, gravelly loamy sand.	SM, SP-SM, SC-SM	A-2, A-1	0	0	70-90	65-85	30-50	10-30	15-20	NP-5
Combate	0-2	Loamy sand	SM, SC-SM, SP-SM	A-2, A-1	0	0	75-95	70-90	40-65	10-15	15-25	NP-5
	2-32	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2, A-1 A-4	0	0	85-100	80-100	40-70	15-40	15-25	NP-5
	32-60	Sandy loam	SM, SC-SM	A-2, A-4	0	0	85-100	80-100	50-70	25-40	15-25	NP-5
2 Blacktail	0-1	Gravelly sandy loam.	SM, GM	A-1	0	0	55-80	50-75	30-50	15-25	20-30	NP-5
	1-16	Clay, gravelly clay.	CL, GC, SC	A-7	0	0	65-90	60-85	55-85	45-65	35-50	15-25
	16-34	Gravelly sandy clay loam.	SC, GC, GM, SM	A-6, A-2 A-1, A-4	0	0	55-80	50-75	40-60	20-40	30-40	5-15
	34-43	Gravelly sandy loam.	SM, GM	A-1	0	0	55-80	50-75	30-50	15-25	20-30	NP-5
	43-60	Gravelly loamy sand.	SM, SC-SM GM, GM-GC	A-2, A-1, A-3	0	0	55-80	50-75	25-55	5-20	15-25	NP-5
3*:												
Budlamp	0-7	Very gravelly sandy loam.	GM, GM-GC, GP-GM	A-1	0	0-5	35-55	25-50	20-35	10-20	20-25	NP-5
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Budlamp	0-7	Very gravelly sandy loam.	GM, GM-GC, GP-GM	A-1	0	0-5	35-55	25-50	20-35	10-20	20-25	NP-5
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Woodcutter	0-2	Gravelly fine sandy loam.	GM, SC-SM, GM-GC, SM	A-1, A-2	0	0	55-80	50-75	35-50	15-30	20-25	NP-5
	2-14	Very gravelly clay loam, very gravelly sandy clay loam.	GC, GM-GC, GP-GC	A-1, A-2	0	0	35-45	30-40	25-40	10-30	25-35	5-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
4 Chiricahua	0-1	Very gravelly clay loam.	GC, SC, GP-GC, SP-SC	A-2	0	0	50-70	30-50	20-40	10-30	25-5	15-25
	1-17	Gravelly clay, gravelly clay loam, clay.	CL, SC, GC	A-7	0	0	70-90	60-85	45-65	40-55	40-50	15-25
	17-20	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	20	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
5 Combate	0-2	Loamy sand	SM, SC-SM, SP-SM	A-2, A-1	0	0	75-95	70-90	40-65	10-15	15-25	NP-5
	2-32	Sandy loam, coarse sandy loam.	SM, SC-SM	A-2, A-1, A-4	0	0	85-100	80-100	40-70	15-40	15-25	NP-5
	32-60	Sandy loam	SM, SC-SM	A-2, A-4	0	0	85-100	80-100	50-70	25-40	15-25	NP-5
6*: Elgin	0-1	Very gravelly fine sandy loam.	GM, GM-GC, GP-GM	A-1	0	0-5	30-50	25-45	20-35	10-25	20-25	NP-5
	1-15	Clay		A-7, A-6	0	0-5	85-100	80-95	70-95	60-90	35-50	15-25
	15-21	Gravelly sandy clay loam.	CL SC, GC	A-2, A-6	0	0-5	55-80	50-75	40-65	20-40	30-40	10-15
	21-27	Gravelly sandy loam.	SM, SC-SM,	A-2, A-1	0	0-5	55-80	50-75	30-50	15-30	20-25	NP-5
	27-60	Very gravelly sandy loam.	GM-GC, GM GM, GM-GC, GP-GM	A-1	0	0-5	40-55	35-50	20-35	10-20	20-25	NP-5
Stronghold	0-2	Very gravelly sandy loam.	GM-GC, GC, GP-GC	A-2, A-1	0	0-5	30-50	25-45	20-45	10-35	20-25	5-10
	2-18	Gravelly sandy loam, gravelly fine sandy loam.	SC, SC-SM, GC, GM-GC	A-2, A-1	0	0-5	55-80	50-75	30-50	15-30	20-25	5-10
	18-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM, GM, GM-GC	A-2, A-1	0	0-5	55-80	50-75	30-50	15-30	20-25	NP-5

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
7 Epitaph	0-1	Very cobbly clay loam.	CL, SC, GC	A-6, A-7	0	40-50	60-80	55-75	50-75	40-60	25-45	10-20
	1-6	Clay	CL, CH	A-7, A-6	0	0-5	90-100	85-100	75-100	65-90	30-65	10-5
	6-27	Clay	CL, CH	A-7, A-7	0	0-5	90-100	85-100	75-100	65-90	30-65	10-5
	27-38	Indurated	---	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
8*: Forest	0-1	Fine sandy loam.	SC-SM, SM	A-4	0	0	90-100	85-95	60-80	35-50	20-25	NP-5
	107	Sandy clay loam.	SC	A-2, A-6	0	0	90-100	85-95	70-85	30-50	30-40	10-15
	7-39	Clay loam, clay.	CL	A-7	0	0	90-100	85-100	75-100	60-95	40-50	15-25
	39-60	Sandy clay loam.	SC	A-4, A-6	0	0	90-100	85-95	60-80	35-50	25-30	8-12
8*: Bonita	0-2	Silt loam	CL-ML, ML	A-4	0	0	95-100	95-100	70-90	55-80	15-25	NP-5
	2-5	Silty clay loam.	CL-ML, CL	A-6, A-4	0	0	95-100	95-100	80-95	70-90	25-40	5-15
	5-20	Silty clay	CL, CH	A-7, A-6	0	0	95-100	95-100	80-100	80-95	35-60	15-35
	20-40	Clay	CL, CH	A-7, A-6	0	0	95-100	95-100	80-100	60-85	35-65	15-5
	40-60	Clay loam	CL-ML, CL	A-6, A-4	0	0	95-100	85-95	75-95	60-75	25-40	5-15
9 Graham	0-1	cobbly clay loam.	CL, SC, CL-ML, SC-SM	A-4	0	25-35	80-90	75-85	65-80	5-65	25-30	5-10
	1-12	Clay	CL, CH	A-7, A-6	0	0-10	90-100	85-100	75-100	65-90	35-60	15-0
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	
10*: Graham	0-1	Very cobbly loam.	CL, SC, CL-ML, SC-SM	A-4	0	55-65	80-90	75-85	65-80	5-65	25-30	5-10
	1-10	Clay	CL, CH	A-7, A-6	0	0-10	90-100	85-100	75-100	65-90	35-60	15-0
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Lampshire	0-5	Very stony loam.	GM-GC, SC-SM, GM, SM	A-2, A-4	20-30	10-25	60-80	50-75	40-60	30-50	20-30	NP-10
	5	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	
11 Grizzle	0-1	Coarse sandy loam.	SM, SC-SM	A-2	0	0	90-100	85-95	50-65	25-35	15-25	NP-5
	1-6	Clay loam	CL	A-6	0	0	95-100	85-100	75-100	60-75	30-35	10-15
	6-32	Loam	CL, CL-ML	A-4	0	0	95-100	85-100	70-95	50-75	25-30	5-10
	32-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	50-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
12*:												
Lampshire	0-15	Very cobbly loam.	GM-GC, SC-SM GM, SM	A-2, A-4	0-10	50-60	60-85	50-75	40-60	30-50	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop	0-3	Fragmental material.	---	---	---	---	---	---	---	---	---	---
	30-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
13*:												
Lampshire	0-14	Very cobbly loam.	GM-GC, SC-SM, GM, SM	A-2, A-4	0-10	50-60	60-85	50-75	40-60	30-50	20-30	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop												
	0-3	Fragmental material	---	---	---	---	---	---	---	---	---	---
	3-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
14	0-3	Loamy sand	SM, SC-SM	A-2, A-1	0	0	90-100	85-95	40-70	15-25	15-20	NP-5
Luckyhills	3-26	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	0	90-100	85-95	50-80	25-50	15-25	NP-5
	26-34	Gravelly sandy loam.	SM, SC-SM	A-2, A-1	0	0	75-90	70-85	40-60	20-35	15-25	NP-5
	34-60	Silt loam	CL, CL-ML	A-4	0	0	90-100	85-95	75-95	60-85	20-30	5-10
15*:												
Luckyhills	0-2	Very gravelly sandy loam.	GM, GM- GC,	A-1	0	0	40-55	35-50	20-35	10-15	15-25	NP-5
	2-13	Gravelly sandy loam.	GP-GM SM, SC, SC-SM,	A-2, A-1	0	0	55-80	50-75	30-50	15-30	15-30	NP-10
	13-31	Sandy loam	GM-GC SM, SC	A-2	0	0	85-95	80-90	50-60	25-35	15-30	NP-10
	31-39	Gravelly sandy loam.	SC-SM SM, SC, SC-SM,	A2, A-1	0	0	55-80	50-75	30-50	15-30	15-30	NP-10
	39-60	Gravelly loam	GM-GC GC, GM-GC, SC-SM, SC	A-4, A-2	0	0	60-80	55-75	45-70	30-45	20-30	5-10
McNeal	0-1	Very gravelly sandy loam.	GM, GM- GC,	A-1	0	0	40-55	35-50	20-35	10-20	15-25	NP-5
	1-21	Clay loam	GP-GM	A-6	0	0	90-100	85-95	75-95	60-75	35-40	10-15
	21-41	Sandy clay loam.	CL, ML SC-SM, SC	A-6, A-4, A-2	0	0	85-95	80-90	65-80	30-50	20-40	5-15
	41-60	Sandy loam	SC-SM, SM	A-2	0	0	85-95	80-90	50-60	25-35	15-25	NP-5

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
16*:												
Luckyhills	0-8	Very gravelly sandy loam.	GM, GM- GC,	A-1	0	0	40-55	35-50	20-35	10-15	15-25	NP-5
	8-13	Gravelly sandy loam.	GP-GM SM, SC, SC-SM,	A-2, A-1	0	0	55-80	50-75	30-50	15-30	15-30	NP-10
	13-31	Sandy loam	GM-GC SM, SC,	A-2	0	0	85-95	80-90	50-60	25-35	15-30	NP-10
	31-39	Gravelly sandy loam.	SC-SM SM, SC, SC-SM,	A-2, A-1	0	0	55-80	50-75	30-50	15-30	15-30	NP-10
	39-60	Gravelly loam	GM-GC GC, GM-GC, SC-SM, SC	A-4, A-2	0	0	60-80	55-75	5-70	30-5	20-30	5-10
McNeal	0-2	Very gravelly sandy loam.	GM, GM- GC,	A-1	0	0	40-55	35-50	20-35	10-20	15-25	NP-5
	2-21	Clay loam	GP-GM	A-6	0	0	90-100	85-95	75-95	60-75	35-40	10-15
	21-41	Sandy clay loam.	CL, ML SC-SM, SC	A-6, A-4, A-2	0	0	85-95	80-90	65-81	30-50	20-40	5-15
	41-60	Sandy loam	SC-SM, SM	A-2	0	0	85-95	80-90	50-60	25-35	15-25	NP-5
17*:												
Mabray	0-5	Very cobbly loam.	GC, GM-GC	A-4, A-2	0	25-40	55-70	50-65	40-60	30-50	20-30	5-10
	5-11	Extremely cobbly loam, very cobbly loam.	GP-GC, GM-GC, SC, GC	A-4, A-1 A-2	0	25-50	25-70	20-65	15-60	10-50	20-30	5-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
17*:												
Chiricahua	0-1	Very gravelly clay loam.	GC, SC, GP-GC, SP-SC	A-2	0	0	50-70	30-50	20-40	10-30	25-45	15-25
	1-20	Gravelly clay, gravelly clay loam, clay.	CL, SC, GC	1-7	0	0	70-90	60-85	45-65	40-55	40-50	15-25
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
18*:												
Mabray	0-5	Very cobbly loam.	GC, GM-GC	A-4, A-2	0	25-40	55-70	50-65	40-60	30-50	20-30	5-10
	5-11	Extremely cobbly loam, very cobbly loam.	GP-GC, GM-GC, SC, GC	A-4, A-1, A-2	0	25-50	25-70	20-65	15-60	10-50	20-30	5-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Chiricahua	0-1	Very gravelly clay loam.	GC, SC, GP-GC, SP-SC	A-2	0	0	50-70	30-50	20-0	10-30	25-5	15-25
	1-20	Gravelly clay, gravelly clay loam, clay.	CL, SC, GC	A-7	0	0	70-90	60-85	45-65	40-55	40-50	15-25
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop	0-3	Fragmental material.	---	---	---	---	---	---	---	---	---	---
	3-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
19*: Mabray	0-8	Extremely cobbly loam.	GM-GC, GC, GP-GC	A-1, A-2	0	35-50	25-35	20-30	15-30	10-20	20-30	5-10
	8-11	Extremely cobbly loam, very cobbly loam.	GP-GC, GM-GC, SC, GC	A-4, A-1, A-2	0	25-50	25-70	20-65	15-60	10-50	20-30	5-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop	0-3	Fragmental material.	---	---	---	---	---	---	---	---	---	---
	3-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
20*: Mabray	0-5	Extremely cobbly loam.	GM-GC, GC, GP-GC	A-1, A-2	0	35-50	25-35	20-30	15-30	10-20	20-30	5-10
	5-11	Extremely cobbly loam, very cobbly loam.	GP-GC, GM-GC, SC, GC	A-4, A-1, A-2	0	25-50	25-70	20-65	15-60	10-50	20-30	5-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
20*: Rock outcrop	0-3	Fragmental material.	---	---	---	---	---	---	---	---	---	---
	3-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
21* McAllister	0-2	Gravelly fine sandy loam.	SM, SC-SM, GM, GM-GC	A-2, A-4	0	0	55-80	50-75	45-65	25-40	20-25	NP-5
	2-35	Gravelly sandy clay loam.	SC, GC	A-2, A-6	0	0	55-80	50-75	40-65	18-40	30-40	10-15
	35-60	Sandy loam	SC, SC-SM	A-2, A-1	0	0	80-95	75-90	45-60	20-35	20-30	5-10

See footnote at end of table.

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
Stronghold	0-1	Very gravelly loamy sand.	GW-GM, GP-GM	A-1	0	0-5	30-50	25-45	15-35	5-10	15-20	NP-5
	1-25	Gravelly sandy loam, Gravelly fine sandy loam.	SC, SC-SM, GC, GM-GC	A-2, A-1	0	0-5	55-80	50-75	30-50	15-3-	20-25	5-10
	25-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM, GM, GM-GC	A-2, A-1	0	0-5	55-80	50-75	20-50	10-30	15-25	NP-5
22 Pedregosa	0-1	Very gravelly fine sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0	0	30-55	25-50	20-45	10-30	15-25	NP-10
	1-7	Very gravelly fine sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0	0	30-55	25-50	20-45	10-30	15-25	NP-10
	7-13	Cemented	---	---	---	---	---	---	---	---	---	---
	13-60	Very gravelly sandy loam. gravelly sandy loam.	SM, SC-SM, GM, GM-GC	A-1	0	0	35-65	30-60	25-50	15-25	15-25	NP-10
23 Pedregosa	0-2	Very gravelly fine sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0	0	30-55	25-50	20-45	10-30	15-25	NP-10
	2-11	Very gravelly fine sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0	0	30-55	25-50	20-45	10-30	15-25	NP-10
	11-17	Cemented	---	---	---	---	---	---	---	---	---	---
	17-60	Very gravelly sandy loam, gravelly sandy loam.	SM, SC-SM, GM, GM-GC	A-1	0	0	35-65	30-60	25-50	15-25	15-25	NP-10
24*:												
Bodecker	0-3	Loamy fine sand.	SM, SC-SM	A-2	0	0-5	90-100	85-95	55-75	20-30	15-25	NP-5
	3-12	Gravelly sand	SM, SC-SM, GP-GM, GM	A-2, A-3, A-1	0	0-5	55-80	50-75	30-60	5-15	15-25	NP-5
	12-29	Very gravelly coarse sand.	GW, GP, GP-GM	A-1	0	0-5	30-50	25-45	10-15	0-5	15-25	NP-5
	29-48	Gravelly sand	SP, SP-SM	A-1	0	0-5	55-80	50-75	25-50	0-10	15-25	NP-5
	48-60	Very gravelly coarse sand.	GW, GP, GP-GM	A-1	0	0-5	30-50	25-45	10-15	0-5	15-25	NP-5
25 Schiefflin	0-6	Very stony loamy sand	SM, SC-SM, SP-SM	A-1, A-2	35-50	0-5	75-95	70-90	35-65	10-15	15-20	NP-5
	6-18	Gravelly sand	SW, SW-SM, SP-SM, SP	A-1	0	0-5	65-80	60-75	30-50	3-11	15-20	NP-5
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
26*:												
Stronghold	0-8	Very gravelly loam.	GM-GC, GC, GP-GC	A-2, A-1	0	0-5	30-50	25-45	20-45	10-35	20-25	5-10
	8-20	Gravelly sandy loam, gravelly fine sandy loam.	SC, SC-SM, GC, GM-GC	A-2, A-1	0	0-5	55-80	50-75	30-50	15-30	20-25	5-10
	20-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM, GM, GM-GC	A-2, A-1	0	0-5	55-80	50-75	20-50	10-30	15-25	NP-5
Bernardino	0-2	Very gravelly fine sandy loam.	SC, SC-SM, GM-GC, GC	A-4, A-2, A-1	0	0-5	55-80	50-75	35-45	20-40	20-25	5-10
	2-15	Clay loam, clay.	CL	A-7, A-6	0	0-5	90-100	85-95	75-95	60-90	35-50	15-30
	15-18	Gravelly clay loam.	CL, GC, SC	A-7, A-6	0	0-5	55-80	50-75	45-75	35-60	25-45	10-20
	18-60	Gravelly sandy loam, gravelly loamy sand.	SM, SC-SM, GP-GM, GM	A-2, A-1	0	0-5	55-80	50-75	25-50	10-30	15-25	NP-5
27*:												
Sutherland	0-2	Very gravelly fine sandy loam.	GM, GM-GC	A-2, A-1	0	0	35-55	30-50	20-40	15-30	15-25	NP-5
	2-8	Very gravelly fine sandy loam.	GM, GC, GM-GC	A-2, A-1	0	0	35-55	30-50	20-40	15-30	15-30	NP-10
	8-10	Cemented	---	---	---	---	---	---	---	---	---	---
	10-60	Very gravelly sandy loam, very gravelly fine sandy loam.	GM, GC, GM-GC, GP-GM	A-2, A-1	0	0	35-55	30-50	20-40	10-30	15-30	NP-10
27*:												
Mule	0-2	Very gravelly fine sandy loam.	GM, GM-GC, GC	A-2, A-1	0	0-5	35-55	30-50	20-40	15-30	15-30	NP-10
	2-10	Very gravelly fine sandy loam.	GM, GC, GM-GC	A-2, A-1	0	0-10	35-55	30-50	20-40	15-30	15-30	NP-10
	10-60	Very gravelly loam.	GM, GC, GM-GC	A-1, A-4, A-2	0	0-10	35-55	30-50	25-50	20-40	15-30	NP-10

TABLE 7. ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid Limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
28 Sutherland	0-1	Very gravelly fine sandy loam.	GM, GM-GC	A-2, A-1	0	0	35-55	30-50	20-40	15-30	15-25	NP-5
	1-18	Very gravelly fine sandy loam.	GM, GC, GM-GC	A-2, A-1	0	0	35-55	30-50	20-40	15-30	15-30	NP-10
	18-42	Cemented	---	---	---	---	---	---	---	---	---	---
	42-60	Very gravelly sandy loam, very gravelly fine sand loam.	GM, GC, GM-GC, GP-GM	A-2, A-1	0	0	35-55	30-50	20-40	10-30	15-30	NP-10
29 Tombstone	0-1	Very gravelly fine sand loam.	GM, GM-GC, GP-GM	A-1	0	0-5	30-55	25-50	20-40	10-20	20-25	NP-5
	1-5	Gravelly fine sandy loam.	SM, SC-SM,	A-2, A-1	0	0-5	55-80	50-75	35-55	20-30	20-25	NP-5
	5-13	Gravelly sandy loam.	GM, GM-GC	A-2, A-1	0	0-5	55-80	50-75	30-50	15-30	20-25	NP-5
	13-60	Very gravelly sandy loam, very gravelly loamy sand.	SM, SC-SM, GM, GM-GC GW-GM, GM-GC, GM, GP-GM	A-1	0	0-5	30-55	25-50	10-35	5-20	20-25	NP-5
30 Woodcutter	0-1	Gravelly sand loam.	GM, SC-SM, GM-GC, SM	A-1, A-2	0	0	55-80	50-75	35-50	15-30	20-25	NP-5
	1-6	Very gravelly loam.	GM	A-1, A-2	0	0	35-55	30-40	20-40	15-30	20-30	NP-5
	6-14	Very gravelly clay loam, very gravelly sandy clay loam.	GC, GM-GC, GP-GC	A-1, A-2	0	0	35-45	30-40	25-40	10-30	25-35	5-15
	14	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under"Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
1*:											
Baboquivari	0-1	3-10	2.0-6.0	0.09-0.13	6.6-7.8	0-0	Low	0.20	5	3	1-3
	1-24	20-30	0.2-2.0	0.14-0.16	6.6-7.8	0-0	Moderate	0.28			
	24-34	5-15	2.0-6.0	0.04-0.13	6.6-7.8	0-0	Low	0.15			
	34-60	3-10	6.0-20	0.04-0.07	7.4-7.8	0-0	Low	0.15			
Combate	0-2	3-10	6.0-20	0.05-0.08	6.6-7.8	<2	Low	0.17	5	2	.5-1
	2-32	3-15	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low	0.24			
	32-60	3-15	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low	0.24			
2	0-1	8-18	2 .0-6.0	0.07-0.10	6.6-7.3	0-0	Low	0.15	5	5	1-2
Blacktail	1-16	35-45	0.06-0.2	0.10-0.15	6.6-7.3	0-0	High	0.17			
	16-34	20-35	0.2-0.6	0.09-0.13	7.4-8.4	0-0	Moderate	0.17			
	34-43	8-18	2.0-6.0	0.07-0.10	7.4-8.4	0-0	Low	0.15			
	43-60	3-10	6.0-20	0.04-0.06	7.4-8.4	0-0	Low	0.10			
3*:											
Budlamp	0-7	5-18	2.0-6.0	0.06-0.09	5.6-6.5	<2	Low	0.10	1	6	1-3
	7	---	---	---	---	---	---	---			
Budlamp	0-7	5-18	2.0-6.0	0.6-0.09	5.6-6.5	<2	Low	0.10	1	6	1-3
	7	---	---	---	---	---	---	---			
Woodcutter	0-2	5-15	2.0-6.0	0.06.0.08	6.1-7.3	<2	Low	0.10	1	6	1-2
	2-14	20-35	0.2-0.6	0.05-0.14	6.1-7.3	<2	Moderate	0.10			
	14	---	---	---	---	---	---	---			
4	0-1	20-35	0.2-0.6	0.09-0.12	5.6-6.5	<2	Moderate	0.10	1	8	1-2
Chiricahua	1-17	35-45	0.06-0.2	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	17-20	---	---	---	---	<2	---	---			
	20	---	---	---	---	---	---	---			
5	0-2	3-10	6.0-20	0.05-0.08	6.6-7.8	<2	Low	0.17	5	2	.5-1
Combate	2-32	3-15	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low	0.24			
	32-60	3-15	2.0-6.0	0.10-0.13	7.4-8.4	<2	Low	0.24			
6*:											
Elgin	0-1	8-15	2.0-6.0	0.08-0.13	6.6-7.8	<2	Low	0.10	3	5	1-2
	1-15	40-55	0.06-0.2	0.09-0.14	6.6-8.4	<2	Moderate	0.28			
	15-21	25-35	0.2-0.6	0.09-0.13	7.4-8.4	<2	Low	0.20			
	21-27	8-18	2.0-6.0	0.07-0.11	7.9-8.4	<2	Low	0.17			
	27-60	8-18	2.0-6.0	0.05-0.08	7.9-8.4	<2	Low	0.17			

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued.

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
Stronghold	0-2	8-18	0.6-6.0	0.06-0.11	7.4-8.4	<2	Low	0.10	2	7	1-2
	2-18	8-18	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low	0.10			
	18-60	3-15	2.0-20	0.03-0.08	7.9-8.4	<2	Low	0.05			
7	0-1	30-40	0.2-0.6	0.08-0.13	7.4-7.8	<2	Moderate	0.10	2	7	1-2
Epitaph	1-6	35-60	0.06-0.2	0.12-0.14	7.4-7.8	<2	High	0.32			
	6-27	35-60	0.06-0.2	0.12-0.14	7.4-8.4	<2	High	0.32			
	27-38	---	---	---	---	---	---	---			
	38	---	---	---	---	---	---	---			
8*:										3	1.2
Forrest	0-1	8-12	2.0-6.0	0.10-0.15	6.6-7.3	<2	Low	0.20	5		
	1-7	25-35	0.2-0.6	0.12-0.16	6.6-7.8	<2	Moderate	0.28			
	7-39	35-45	0.06-0.6	0.12-0.16	7.4-8.4	<2	High	0.28			
	39-60	20-26	0.2-0.6	0.12-0.16	7.9-8.4	<2	Moderate	0.32			
Bonita	0-2	10-15	0.6-2.0	0.19-0.21	7.4-7.8	<2	Low	0.32	5	5	1-3
	2-5	27-35	0.2-0.6	0.19-0.21	7.4-7.8	<2	Moderate	0.32			
	5-20	40-55	0.06-0.2	0.15-0.17	7.4-7.8	<2	High	0.32			
	20-40	40-60	0.06-0.2	0.14-0.16	7.4-8.4	<2	High	0.32			
	40-60	27-40	0.2-0.6	0.19-0.21	7.9-8.4	<2	Moderate	0.32			
9	0-1	15-25	0.6-2.0	0.10-0.14	6.6-7.3	<2	Low	0.17	1	7	1-3
Graham	1-12	40-55	0.06-0.2	0.12-0.16	6.6-7.8	<2	High	0.24			
	12	---	---	---	---	---	---	---			
10*:											
Graham	0-1	15-25	0.6-2.0	0.07-0.11	6.6-7.3	<2	Low	0.10	1	8	1-3
	1-10	40-55	0.06-0.2	0.12-0.16	6.6-7.8	<2	High	0.24			
	10	---	---	---	---	---	---	---			
Lampshire	0-5	10-20	0.6-2.0	0.06-0.07	6.1-8.4	<2	Low	0.05	1	8	1-2
	5	---	---	000	---	---	---	---			
11	0-1	5-15	2.0-6.0	0.09-0.13	7.4-7.8	<2	Low	0.17	4	3	<.5
Grizzle	1-6	28-35	0.2-0.6	0.16-0.21	7.9-8.4	<2	Moderate	0.32			
	6-32	15-27	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low	0.37			
	32-50	---	---	---	---	---	---	---			
	50-60	---	---	---	---	---	---	---			
12*:											
Lampshire	0-15	10-20	0.6-2.0	0.06-0.08	6.1-8.4	<2	Low	0.05	1	8	1-2
	15	---	---	---	---	---	---	---			
Rock outcrop	0-3	---	---	---	---	---	---	---	---	---	---
	3-60	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued.

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
13*:											
Lampshire	0-14	10-20	0.6-2.0	0.06-0.08	6.1-8.4	<2	Low	0.05	1	8	1-2
	14	---	---	---	---	---	---	---			
Rock outcrop	0-3	---	---	---	---	---	---	---	---	---	---
	3-60	---	---	---	---	---	---	---			
14	0-3	3-10	6.0-20	0.05-0.07	7.4-8.4	<2	Low	0.17	5	2	0-1
Luckyhills	3-26	8-15	2.0-6.0	0.09-0.14	7.4-8.4	<2	Low	0.24			
	26-34	8-65	2.0-6.0	0.07-0.11	7.9-8.4	<2	Low	0.15			
	34-60	10-18	0.6-2.0	0.16-0.19	7.9-8.4	<2	Low	0.43			
15*:											
Luckyhills	0-2	5-15	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low	0.05	5	7	0-1
	2-13	5-18	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.10			
	13-31	5-18	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.24			
	31-39	5-18	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.10			
	39-60	10-18	0.6-2.0	0.10-0.14	7.4-8.4	<2	Low	0.17			
McNeal	0-1	5-15	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.05	3	7	0-1
	1-21	30-35	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.37			
	21-41	20-35	0.2-0.6	0.12-0.16	7.4-8.4	<2	Moderate	0.32			
	41-60	5-15	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.24			
16*:											
Luckyhills	0-8	5-15	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low	0.05	5	7	0-1
	8-13	5-18	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.10			
	13-31	5-18	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.24			
	31-39	5-18	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.10			
	39-60	10-18	0.6-2.0	0.10-0.14	7.4-8.4	<2	Low	0.17			
McNeal	0-2	5-15	2.0-6.0	0.07-0.10	7.4-8.4	<2	Low	0.05	3	7	0-1
	2-21	30-35	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.37			
	21-41	20-35	0.2-0.6	0.12-0.16	7.4-8.4	<2	Moderate	0.32			
	41-60	5-15	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low	0.24			
17*:									1	8	1-2
Mabray	0-5	15-25	0.6-2.0	0.05-0.08	7.4-8.4	<2	Low	0.05			
	5-11	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05			
	11	---	---	---	---	---	---	---			
Chiricahua	0-1	20-35	0.2-0.6	0.09-0.12	5.6-6.5	<2	Moderate	0.10	1	8	1-2
	1-20	35-45	0.06-0.2	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	20	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued.

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bilitygroup	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
18*:											
Mabray	0-5	15-25	0.6-2.0	0.05-0.08	7.4-8.4	<2	Low	0.05	1	8	1-2
	5-11	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05			
	11	---	---	---	---	---	---	---			
Chiricahua	0-1	20-35	0.2-0.6	0.09-0.12	6.5-6.5	<2	Moderate	0.10	2	8	1-2
	1-20	35-45	0.06-0.2	0.15-0.18	6.1-7.8	<2	Moderate	0.24			
	20	---	---	---	---	---	---	---			
Rock outcrop	0-3	---	---	---	---	---	---	---			
	3-60	---	---	---	---	---	---	---			
19*:											
Mabray	0-8	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05	1	8	1-2
	8-11	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05			
		---	---	---	---	---	---	---			
Rock outcrop	0-3	---	---	---	---	---	---	---	---	---	---
	3-60	---	---	---	---	---	---	---			
20*:											
Mabray	0-5	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05	1	8	1-2
	5-11	15-25	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low	0.05			
	11	---	---	---	---	---	---	---			
Rock outcrop	0-3	---	---	---	---	---	---	---	---	---	---
	3-60	---	---	---	---	---	---	---			
21*:											
McAllister	0-2	8-15	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low	0.17	5	5	1-2
	2-35	24-35	0.2-0.6	0.09-0.12	7.4-8.4	<2	Moderate	0.17			
	35-60	10-18	2.0-6.0	0.09-0.13	7.9-8.4	<2	Low	0.15			
Stronghold	0-1	3-10	6.0-20	0.03-0.05	7.4-8.4	<2	Low	0.05	2	6	1-2
	1-25	8-18	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low	0.10			
	25-60	3-15	2.0-20	0.03-0.08	7.9-8.4	<2	Low	0.05			
22	0-1	5-15	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low	0.10	1	6	1-2
Pedregosa	1-7	10-18	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low	0.10			
	7-13	---	---	---	---	---	---	---			
	13-60	5-15	2.0-6.0	0.05-0.07	7.4-8.4	<2	Low	0.10			
23	0-2	5-15	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low	0.10	1	6	1-2
Pedregosa	2-11	10-18	2.0-6.0	0.06-0.10	7.4-8.4	<2	Low	0.10			
	11-17	---	---	---	---	---	---	---			
	17-60	5-15	2.0-6.0	0.05-0.07	7.4-8.4	<2	Low	0.10			

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued.

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bilitygroup	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/cm					Pct
24*:											<.1
Riverwash	0-6	0-1	>20	0.03-0.04	6.1-8.4	<2	Low	0.02	5	2	
	6-60	0-5	>20	0.01-0.03	6.1-8.4	<2	Low	0.02			
Bodecker	0-3	3-10	6.0-20	0.08-0.11	7.4-8.4	0-0	Low	0.17	5	2	<.5
	3-12	3-10	6.0-20	0.04-0.05	7.4-8.4	0-0	Low	0.05			
	12-29	3-10	>20	0.02-0.05	7.9-8.4	0-0	Low	0.05			
	29-48	3-10	6.0-20	0.04-0.05	7.9-8.4	0-0	Low	0.05			
	48-60	3-10	>20	0.02-0.05	7.9-8.4	0-0	Low	0.05			
25	0-6	3-10	6.0-20	0.05-0.08	6.1-7.3	<2	Low	0.10	1	5	1-3
Schiefflin	6-18	3-10	6.0-20	0.04-0.07	5.6-6.5	<2	Low	0.10			
	18	---	---	---	---	---	---	---			
26*:											
Stronghold	0-8	8-18	0.6-6.0	0.06-0.11	7.4-8.4	<2	Low	0.10	2	7	1-2
	8-20	8-18	2.0-6.0	0.05-0.08	7.4-8.4	<2	Low	0.10			
	20-60	3-15	2.0-20	0.03-0.08	7.9-8.4	<2	Low	0.05			
Bernardino	0-2	10-18	2.0-6.0	0.05-0.10	6.6-7.3	<2	Low	0.05	2	6	1-2
	2-15	35-50	0.06-0.2	0.18-0.21	6.6-7.8	<2	Moderate	0.28			
	15-18	30-40	0.2-0.6	0.12-0.17	7.9-8.4	<2	Moderate	0.15			
	18-60	5-12	2.0-20	0.04-0.09	7.9-8.4	<2	Low	0.10			
27*:											
Sutherland	0-2	5-15	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low	0.05	1	6	1-3
	2-8	5-18	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low	0.05			
	8-10	---	---	---	---	---	---	---			
	10-60	5-18	2.0-6.0	0.05-0.09	7.4--8.4	<2	Low	0.05			
Mule	0-2	5-18	2.0-6.0	0.06-0.09	7.4--8.4	>2	Low	0.05	5	5	1-3
	2-10	5-18	2.0-6.0	0.06-0.09	7.4--8.4	>2	Low	0.05			
	10-60	5-18	0.6-2.0	0.07-0.11	7.4--8.4	>2	Low	0.10			
28	0-1	5-15	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low	0.05	1	6	1-3
Sutherland	1-18	5-18	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low	0.05			
	18-24	---	---	---	---	---	---	---			
	24-60	5-1	2.0-6.0	0.05-0.09	7.4-8.4	<2	Low	0.05			
29	0-1	8-10	2.0-6.0	0.06-0.08	7.9-8.4	<2	Low	0.05	5	6	1-2
Tombstone	1-5	8-15	2.0-6.0	0.08-0.11	7.9-8.4	<2	Low	0.10			
	5-13	8-15	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.17			
	13-60	5-15	2.0-20	0.03-0.07	7.9-8.4	<2	Low	0.05			

See footnote at end of table.

TABLE 8. PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued.

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bilitygr oup	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	mmhos/ cm					Pct
30	0-1	5-15	2.0-6.0	0.06-0.08	6.1-7.3	<2	Low	0.10	1	6	1-2
Woodcutter	1-6	8-18	0.6-2.0	0.05-0.10	6.1-7.3	<2	Low	0.10			
	6-14	20-35	0.2-0.6	0.05-0.14	6.1-7.3	<2	Moderate	0.10			
	14	---	---	---	---	---	---	---			

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9. SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and perched" are explained in the test. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated).

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
1*:					In		In			
Baboquivari	C	None	- - -	- - -	>60	- - -	- - -	- - -	Moderate	Low
Combate	B	Rare	- - -	- - -	>60	- - -	- - -	- - -	Moderate	Low
2										
Blacktail	C	None	- - -	- - -	>60	- - -	- - -	- - -	High	Moderate
3*:										
Budlamp	D	None	- - -	- - -	5-20	Hard	- - -	- - -	High	Moderate
Budlamp	D	None	- - -	- - -	5-20	Hard	- - -	- - -	High	Moderate
Woodcutter	D	None	- - -	- - -	8-20	Hard	- - -	- - -	High	Moderate
4										
Chiricahua	D	None	- - -	- - -	20-30	Hard	- - -	- - -	High	Low
5										
Combate	B	Rare	- - -	- - -	>60	- - -	- - -	- - -	Moderate	Low
6*:										
Elgin	C	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
Stronghold	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
7										
Epitaph	D	None	- - -	- - -	20-40	Hard	20-40	Thick	High	Low
8*:										
Forrest	C	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
Bonita	D	Occasional	Very brief - - -	Jul-Sep	>60	- - -	- - -	- - -	High	Low
9										
Graham	D	None	- - -	- - -	8-20	Hard	- - -	- - -	High	Low
10*:										
Graham	D	None	- - -	- - -	8-20	Hard	- - -	- - -	High	Low
Lampshire	D	None	- - -	- - -	4-20	Hard	- - -	- - -	Moderate	Low
11										
Grizzle	D	None	- - -	- - -	25-60	Hard	- - -	- - -	High	Low

TABLE 9. SOIL AND WATER FEATURES--Continued.

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					In		In			
12*, 13*:										
Lampshire	D	None	- - -	- - -	4-20	Hard	- - -	- - -	Moderate	Low
Rock outcrop	D	None	- - -	- - -	0-3	Hard	- - -	- - -	- - -	- - -
14										
Luckyhills	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
15*, 16*:										
Luckyhills	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
17*:										
Mabray	D	None	- - -	- - -	4-20	Hard	- - -	- - -	High	Low
Chiricahua	D	None	- - -	- - -	20-30	Hard	- - -	- - -	High	Low
18*:										
Mabray	D	None	- - -	- - -	4-20	Hard	- - -	- - -	High	Low
Chiricahua	D	None	- - -	- - -	20-30	Hard	- - -	- - -	High	Low
Rock outcrop	D	None	- - -	- - -	0-3	Hard	- - -	- - -	- - -	- - -
19*, 20*:										
Mabray	D	None	- - -	- - -	4-20	Hard	- - -	- - -	High	Low
Rock outcrop	D	None	- - -	- - -	0-3	Hard	- - -	- - -	- - -	- - -
21*:										
McAllister	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
Stronghold	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
22, 23										
Pedregosa	C	None	- - -	- - -	>60	- - -	5-20	Thin	High	Low
24*:										
Riverwash	A	Frequent	Very brief to brief	Jun-Mar	>60	- - -	- - -	- - -	Moderate	Low
Bodecker	A	Occasional	Very brief	Jul-0ct	>60	- - -	- - -	- - -	High	Low
25										
Schiefflin	D	None	- - -	- - -	5-20	Hard	- - -	- - -	Moderate	Moderate
26*:										
Stronghold	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
Bernardino	C	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
27*:										
Sutherland	C	None	- -	- - -	>60	- - -	5-20	Thick	High	Low
Mule	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low

TABLE 9. SOIL AND WATER FEATURES--Continued.

Soil name and map symbol	Hydro- logic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					In		In			
28 Sutherland	C	None	- - -	- - -	>60	- - -	5-20	Thick	High	Low
29 Tombstone	B	None	- - -	- - -	>60	- - -	- - -	- - -	High	Low
30 Woodcutter	D	None	- - -	- - -	8-20	Hard	- - -	- - -	High	Moderate

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 10. SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation).

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1*:					
Baboquivari	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Poor: seepage
Combate	Moderate: flooding	Severe: seepage	Moderate: slope	Moderate: slope	Fair: small stones slope
2					
Blacktail	Severe: percs slowly	Severe: seepage slope	Moderate: slope	Moderate: slope	Fair: small stones slope
3*:					
Budlamp	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock seepage slope	Severe: depth to rock slope	Poor: depth to rock slope
Budlamp	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock seepage slope	Severe: depth to rock slope	Poor: depth to rock slope
Wooductter	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Poor: depth to rock small stones slope
4					
Chiricahua	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock	Moderate: slope	Poor: depth to rock
5					
Combate	Moderate: flooding	Severe: seepage	Moderate: flooding	Moderate: flooding	Good
6*:					
Elgin	Moderate slope	Severe: seepage slope	Moderate: slope	Moderate: slope	Poor: seepage small stones
Stronghold	Severe: poor filter	Severe: seepage slope	Moderate: slope too sandy	Moderate: slope	Poor: small stones
7					
Epitaph	Severe: depth to rock cemented pan percs slowly	Severe: depth to rock cemented pan percs slowly	Severe: depth to rock cemented pan too clayey	Severe: depth to rock cemented pan	Poor: depth to rock too clayey hard to pack

TABLE 10. SANITARY FACILITIES -- Continued.

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
8*:					
Forrest	Severe: percs slowly	Moderate: slope	Slight	Slight	Good
Bonita	Severe: flooding percs slowly	Severe: flooding	Severe: flooding too clayey	Severe: flooding	Poor: too clayey hard to pack
9					
Graham	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock	Moderate: slope	Poor: depth to rock
10*:					
Graham	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: slope	Poor: depth to rock slope
Lampshire	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: Slope	Poor: depth to rock slope
11					
Grizzle	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor depth to rock
12*:					
Lampshire	Severe: depth to rock large stones	Severe: depth to rock slope large stones	Severe: depth to rock large stones	Moderate: slope	Poor: depth to rock
Rock outcrop	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
13*:					
Lampshire	Severe: depth to rock slope large stones	Severe: depth to rock slope large stones	Severe: depth to rock slope large stones	Severe: slope	Poor: depth to rock slope
Rock outcrop	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Poor: depth to rock slope
14					
Luckyhills	Moderate: percs slowly	Severe: seepage	Slight	Slight	Good
15*:					
Luckyhills	Moderate: percs slowly	Severe: seepage	Slight	Slight	Fair: small stones
McNeal	Severe: percs slowly	Severe: seepage	Slight	Slight	Good

TABLE 10. SANITARY FACILITIES -- Continued.

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
16* Luckyhills	Moderate: percs slowly slope	Severe: seepage slope	Moderate: slope	Moderate: slope	Fair: small stones slope
McNeal	Severe: percs slowly	Severe: seepage slope	Moderate: slope	Moderate: slope	Fair: slope
17*: Mabray	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock large stones	Moderate: slope	Poor: depth to rock small stones
17*: Chiricahua	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock	Moderate slope	Poor: depth to rock
18*: Mabray	Severe: depth to rock slope	Severe: depth to rock slope large stones	Severe: depth to rock slope large stones	Severe: slope	Poor: depth to rock small stones slope
Chiricahua	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: slope	Poor: depth to rock slope
Rock outcrop	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Poor: depth to rock slope
19*: Mabray	Severe: depth to rock	Severe: depth to rock slope large stones	Severe: depth to rock large stones	Moderate: slope	Poor: depth to rock small stones
Rock outcrop	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
20*: Mabray	Severe: depth to rock slope	Severe: depth to rock slope large stones	Severe: depth to rock slope large stones	Severe: slope	Poor depth to rock small stones slope
Rock outcrop	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Poor: depth to rock slope

TABLE 10. SANITARY FACILITIES -- Continued.

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
21*:					
McAllister	Severe: percs slowly	Severe: seepage	Slight	Slight	Fair: small stones
Stronghold	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Poor: small stones
22					
Pedregosa	Severe: cemented pan	Severe: seepage cemented pan	Moderate: cemented pan	Slight	Poor: cemented pan small stones
23					
Pedregosa	Severe: cemented pan	Severe: seepage cemented pan slope	Moderate: cemented pan slope	Moderate slope	Poor: cemented pan small stones
24*:					
Riverwash	Severe: flooding poor filter	Severe: seepage flooding	Severe: flooding seepage too sandy	Severe: flooding seepage	Poor: seepage too sandy small stones
24*:					
Bodecker	Severe: flooding poor filter	Severe: seepage flooding	Severe: flooding too sandy	Severe: flooding	Poor: seepage too sandy small stones
25					
Schiefflin	Severe: depth to rock	Severe: seepage depth to rock slope	Severe: depth to rock too sandy	Moderate: slope	Poor: depth to rock seepage too sandy
26*:					
Stronghold	Severe: poor filter slope	Severe: seepage slope	Severe: slope	Severe: slope	Poor: small stones slope
Bernardino	Severe: poor filter slope	Severe: seepage slope	Severe: slope	Severe: slope	Poor: seepage small stones slope

TABLE 10. SANITARY FACILITIES -- Continued.

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
27* Sutherland	Severe: cemented pan	Severe: seepage cemented pan slope	Severe: cemented pan	Moderate: slope	Poor: cemented pan seepage small stones
Mule	Moderate: percs slowly slope	Severe: slope	Severe: excess salt	Moderate: slope	Poor: small stones
28 Sutherland	Severe: cemented pan	Severe: seepage cemented pan	Severe: cemented pan	Slight	Poor: cemented pan seepage small stones
29 Tombstone	Severe: poor filter	Severe: seepage slope	Moderate: slope too sandy	Moderate: slope	Poor: seepage small stones
30 Woodcutter	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock slope	Poor: depth to rock small stones slope

*See description of the map unit for composition and behavior characteristics of the map unit.

Table 11. BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation).

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1*:						
Baboquivari	Severe: cutbanks cave	Moderate: shrink-swell	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: droughty
Combate	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: small stones droughty
2						
Blacktail	Severe: cutbanks cave	Moderate: shrink-swell slope	Moderate: slope shrink-swell	Severe: slope	Moderate: shrink-swell slope	Moderate: small stones droughty slope
3*:						
Budlamp	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: small stones droughty slope
Budlamp	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: small stones droughty slope
Woodcutter	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock
4						
Chiricahua	Severe: depth to rock	Moderate: shrink-swell slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: depth to rock shrink-swell slope	Severe: small stones
5						
Combate	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: small stones droughty
6*:						
Elgin	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: small stones
Stronghold	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: small stones droughty
7						
Epitaph	Severe: depth to rock cemented pan cutbanks cave	Severe: shrink-swell	Severe: depth to rock cemented pan shrink-swell	Severe: shrink-swell slope	Severe: shrink-swell low strength	Severe: large stones

See footnote at end of table.

TABLE 11. BUILDING SITE DEVELOPMENT -- Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
8*: Forrest	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell low strength	Slight
8*: Bonita	Severe: cutbanks cave	Severe: flooding shrink-swell	Severe: flooding shrink-swell	Severe: flooding shrink-swell	Severe: shrink-swell low strength flooding	Moderate: flooding
9 Graham	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: large stones depth to rock
10*: Graham	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: large stones slope depth to rock
Lampshire	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock
11 Grizzle	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: slope depth to rock	Moderate: depth to rock	Moderate: depth to rock
12*: Lampshire	Severe: depth to rock large stones	Severe: depth to rock large stones	Severe: depth to rock large stones	Severe: slope depth to rock large stones	Severe: depth to rock large stones	Severe: large stones depth to rock
Rock outcrop	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock
13*: Lampshire	Severe: depth to rock large stones slope	Severe: slope depth to rock large stones	Severe: depth to rock slope large stones	Severe: slope depth to rock large stones	Severe: depth to rock slope large stones	Severe: large tones slope depth to rock
Rock outcrop	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock
14 Luckyhills	Slight	Slight	Slight	Slight	Slight	Moderate: droughty
15*: Luckyhills	Slight	Slight	Slight	Moderate: slope	Slight	Severe: small stones

See footnote at end of table.

TABLE 11. BUILDING SITE DEVELOPMENT -- Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
McNeal	Slight	Moderate: shrink-swell	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell	Severe: small stones
16*: Luckyhills	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: small stones
16*: McNeal	Moderate: slope	Moderate: shrink-swell slope	Moderate: slope shrink-swell	Severe: slope	Moderate: shrink-swell slope	Severe: small stones
17*: Mabray	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: large stones droughty
Chiricahua	Severe: depth to rock	Moderate: shrink-swell slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: depth to rock shrink-swell slope	Severe: small stones
18*: Mabray	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: large stones droughty
Chiricahua	Severe: depth to rock slope	Severe: slope	Severe: depth to rock slope	Severe: slope	Severe: slope	Severe: small stones slope
Rock outcrop	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock
19*: Mabray	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: small stones large stones droughty
Rock outcrop	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock
20*: Mabray	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: small stones large stones droughty
Rock outcrop	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock

See footnote at end of table.

TABLE 11. BUILDING SITE DEVELOPMENT -- Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
21*:						
McAllister	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Moderate: shrink-swell	Moderate: small stones droughty
Stronghold	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Severe: small stones droughty
22 Pedregosa	Severe: cemented pan	Moderate: cemented pan	Severe: cemented pan	Moderate: slope cemented pan	Moderate: cemented pan	Severe: small stones cemented pan
23 Pedregosa	Severe: cemented pan	Moderate: slope cemented pan	Severe: cemented pan	Severe: slope	Moderate: cemented pan slope	Severe: small stones cemented pan
25 Schiefflin	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: droughty depth to rock
26*:						
Stronghold	Severe: cutbanks cave slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: small stones droughty slope
Bernardino	Severe: cutbanks cave slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
27*:						
Sutherland	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan	Severe: slope cemented pan	Severe: cemented pan	Severe: small stones cemented pan
Mule	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: excess salt small stones
28 Sutherland	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan	Severe: cemented pan	Severe: small stones cemented pan
29 Tombstone	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Moderate: slope	Moderate: slope	Severe: small stones droughty
30 Woodcutter	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock	Severe: depth to rock slope	Severe: slope depth to rock

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12. - CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*:				
Baboquivari	Good	Probable	Probable	Fair: too clayey small stones area reclaim
Combate	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
2				
Blacktail	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
3*:				
Budlamp	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope
Budlamp	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope
Woodcutter	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope
4				
Chiricahua	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too clayey small stones
5				
Combate	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones

TABLE 12 - CONSTRUCT ION MATERIALS- - Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
6*:				
Elgin	Good	Probable	Probable	Poor: too clayey small stones area reclaim
Stronghold	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones area reclaim
7				
Epitaph	Poor: depth to rock shrink-swell low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
8*:				
Forest	Fair: shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
8*:				
Bonita	Fair: shrink-swell low strength	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
9				
Graham	Poor: depth to rock	Improbable: excess fines	Improbable excess fines	Poor: depth to rock too clayey small stones
10*:				
Graham	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock too clayey small stones
Lampshire	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope

TABLE 12 - CONSTRUCT ION MATERIALS- - Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11 Grizzle	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: depth to rock small stones think layer
12*: Lampshire	poor: depth to rock large stones	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock large stones
Rock outcrop	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
13*: Lampshire	Poor: depth to rock large stones slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock large stones slope
Rock outcrop	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock slope
14 Luckyhills	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
15*: Luckyhills	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
McNeal	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey small stones
16*: Luckyhills	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
16*: McNeal	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey small stones slope

TABLE 12 - CONSTRUCT ION MATERIALS- - Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
17*:				
Mabray	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones
Chiricahua	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too clayey small stones
18*:				
Mabray	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope
Chiricahua	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too clayey small stones slope
Rock outcrop	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock slope
19*:				
Mabray	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones
Rock outcrop	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
20*:				
Mabray	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope
Rock outcrop	Poor: depth to rock slope	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock slope
21*:				
McAllister	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones

TABLE 12 - CONSTRUCT ION MATERIALS- - Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Stronghold	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones area reclaim
22, 23 Pedregosa	Good	Improbable: excess fines	Improbable: excess fines	Poor: cemented pan small stones area reclaim
24*: Riverwash	Good	Probable	Probable	Poor: too sandy small stones area reclaim
Bodecker	Good	Probable	Probable	Poor: too sandy small stones area reclaim
25 Schiefflin	Poor: depth to rock	Improbable: thin layer	Improbable: thin layer	Poor: depth to rock too sandy small stones
26*: Stronghold	Fair: slope	Improbable: excess fines	Imporbable: excess fines	Poor: small stones area reclaim slope
Bernardino	Fair: slope	Probable:	Probable:	Poor: small stones area reclaim slope
27*: Sutherland	Poor: cemented pan	Improbable: small stones	Probable:	Poor: cemented pan small stones slope

TABLE 12 - CONSTRUCT ION MATERIALS- - Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mule	Good:	Improbable: excess fines	Improbable: excess fines	Poor: small stones area reclaim excess salt
28 Sutherland	Poor: cemented pan	Improbable: small stones	Probable:	Poor: cemented pan small stones area reclaim
29 Tombstone	Good:	Probable:	Probable:	Poor: small stones area reclaim
30 Woodcutter	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock small stones slope

*See description of the map unit for composition and behavior characteristics of the map unit.

Table 13. WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation).

Soil name and map symbol	Limitations for - -		Features affecting - -		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
1*: Baboquivari	Severe: seepage	Severe: seepage	Deep to water	Droughty soil blowing	Too sandy soil blowing
Combate	Severe: seepage	Severe: seepage piping	Deep to water	Droughty fast intake	Soil blowing
2 Blacktail	Severe: seepage slope	Moderate: thin layer seepage piping	Deep to water	Slope droughty percs slowly	Slope
3*: Budlamp	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope droughty depth to rock	Slope depth to rock
Budlamp	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope droughty depth to rock	Slope depth to rock
Woodcutter	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope droughty depth to rock	Slope depth to rock
4 Chiricahua	Severe: slope	Severe: thin layer	Deep to water	Slope percs slowly depth to rock	Slope depth to rock percs slowly
5 Combate	Severe: seepage	Severe: seepage piping	Deep to water	Droughty fast intake	Soil blowing
6*: Elgin	Severe: seepage slope	Severe: seepage	Deep to water	Slope droughty percs slowly	Slope
Stronghold	Severe: seepage slope	Severe: seepage	Deep to water	Slope droughty	Slope too sandy
7 Epitaph	Severe: slope	Severe: hard to pack	Deep to water	Slope percs slowly depth to rock	Slope depth to rock cemented pan
8*: Forrest	Slight	Slight	Deep to water	Soil blowing percs slowly	Soil blowing percs slowly
Bonita	Slight	Severe: hard to pack	Deep to water	Percs slowly flooding	Percs slowly

See footnote at end of table.

TABLE 13. WATER MANAGEMENT - - Continued.

Soil name and map symbol	Limitations for - -		Features affecting - -		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
9					
Graham	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope percs slowly depth to rock	Slope depth to rock
10*:					
Graham	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope percs slowly depth to rock	Slope large stones depth to rock
Lampshire	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope droughty depth to rock	Slope large stones depth to rock
11					
Grizzle	Moderate: seepage depth to rock slope	Severe: piping	Deep to water	lope soil blowing depth to rock	Depth to rock erodes easily soil blowing
12*, 13*:					
Lampshire	Severe: depth to rock slope	Severe: large stones	Deep to water	Slope large stones droughty	Slope large stones depth to rock
Rock outcrop	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope depth to rock	Slope depth to rock
14					
Luckyhills	Severe: seepage	Severe: piping	Deep to water	Droughty fast intake soil blowing	Erodes easily soil blowing
15*:					
Luckyhills	Severe: seepage	Slight	Deep to water	Slope droughty	Favorable
McNeal	Severe: seepage	Slight	Deep to water	Slobe	Erodes easily
16*:					
Luckyhills	Severe: seepage slope	Slight	Deep to water	Slope droughty	Slope
McNeal	Severe: seepage slope	Slight	Deep to water	Slope	Slope erodes easily
17*:					
Mabray	Severe: depth to rock slope	Severe: large stones	Deep to water	Slope large stones droughty	Slope large stones depth to rock
Chiricahua	Severe: slope	Severe: thin layer	Deep to water	Slope percs slowly depth to rock	Slope depth to rock percs slowly

See footnote at end of table.

TABLE 13. WATER MANAGEMENT - - Continued.

Soil name and map symbol	Limitations for - -		Features affecting - -		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
18*: Mabray	Severe: depth to rock slope	Severe: large stones	Deep to water	Slope large stones droughty	Slope large stones depth to rock
18*: Chiricahua	Severe: slope	Severe: thin layer	Deep to water	Slope percs slowly depth to rock	Slope depth to rock percs slowly
Rock outcrop	Severe: depth to rock slope	Severe: think layer	Deep to water	Slope depth to rock	Slope depth to rock
19*, 20*: Mabray	Severe: depth to rock slope	Severe: large stones	Deep to water	Slope large stones droughty	Slope large stones depth to rock
Rock outcrop	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope depth to rock	Slope depth to rock
21*: McAllister	Severe: seepage	Slight	Deep to water	Slope droughty	Favorable
Stronghold	Severe: seepage	Severe: seepage	Deep to water	Slope droughty fast intake	Too sandy
23 Pedregosa	Severe: seepage cemented pan slope	Severe: seepage	Deep to water	Slope droughty cemented pan	Slope cemented pan
24*: Riverwash	Severe: seepage	Severe: seepage	Deep to water	Droughty fast intake	Too sandy soil blowing
Bodecker	Severe: seepage	Severe: seepage	Deep to water	Droughty fast intake soil blowing	Too sandy soil blowing
25 Schiefflin	Severe: depth to rock slope	Severe: seepage	Deep to water	Slope droughty fast intake	Slope depth to rock too sandy

TABLE 13. WATER MANAGEMENT - - Continued.

Soil name and map symbol	Limitations for - -		Features affecting - -		
	Pond reservoir areas	Embankments, dikes and levees	Drainage	Irrigation	Terraces and diversions
26*:					
Stronghold	Severe: seepage slope	Severe: seepage	Deep to water	Slope droughty	Slope too sandy
Bernardino	Severe: seepage slope	Severe: seepage	Deep to water	Slope droughty percs slowly	Slope too sandy
Sutherland	Severe: seepage cemented pan slope	Severe: seepage	Deep to water	Slope droughty cemented pan	Slope cemented pan
27*:					
Mule	Severe: slope	Severe: excess salt	Deep to water	Slope droughty excess salt	Slope
28					
Sutherland	Severe: seepage cemented pan	Severe: seepage	Deep to water	Slope droughty cemented pan	Cemented pan
29					
Tombstone	Severe: seepage slope	Severe: seepage	Deep to water	Slope droughty	Slope too sandy
30					
Woodcutter	Severe: depth to rock slope	Severe: thin layer	Deep to water	Slope droughty depth to rock	Slope depth to rock

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14. CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Baboquivari	Fine-loamy, mixed, superactive, thermic Ustic Haplargids
Bernardino	Fine, mixed, superactive, thermic Ustic Calciargids
Blacktail	Fine, mixed, superactive, thermic Calcidic Argiustolls
Bodecker	Sandy-skeletal, mixed, thermic Ustic Torriorthents
Bonita	Fine, smectitic, thermic Typic Haplotorrerts
Budlamp	Loamy-skeletal, mixed, superactive, thermic Lithic Haplustolls
Chiricahua	Clayey, mixed, superactive, thermic, shallow Ustic Haplargids
Combate	Coarse-loamy, mixed, superactive, nonacid, thermic Ustic Torrifluvents
Elgin	Fine, mixed, superactive, thermic Calcic Paleargids
Epitaph	Fine, smectitic, thermic Petrocalcic Calcitorrerts
Forrest	Fine, mixed, superactive, thermic Ustic Calciargids
Graham	Clayey, smectitic, thermic Lithic Ustic Haplargids
Grizzle	Fine-loamy, mixed, superactive, thermic Ustic Calciargids
Lampshire	Loamy-skeletal, mixed, superactive, nonacid, thermic Lithic Ustic Torriorthents
Luckyhills	Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids
Mabray	Loamy-skeletal, carbonatic, thermic Lithic Ustic Torriorthents
McAllister	Fine-loamy, mixed, superactive, thermic Ustic Calciargids
McNeal	Fine-loamy, mixed, superactive, thermic Ustic Calciargids
Mule	Loamy-skeletal, carbonatic, thermic Ustic Haplocalcids
Riverwash Rock outcrop	
Pedregosa	Loamy-skeletal, mixed, superactive, thermic, shallow Ustic Petrocalcid
Schiefflin	Mixed, thermic, Lithic Torripsamments
Stronghold	Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids
Sutherland	Loamy-skeletal, carbonatic, thermic shallow Calcic Petrocalcids
Tombstone	Loamy-skeletal, mixed, superactive, thermic Ustic Haplocalcids
Woodcutter	Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustolls

TABLE 15. CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	- - -	- - -	- - -	- - -	- - -
II	- - -	- - -	- - -	- - -	- - -
III	- - -	- - -	- - -	- - -	- - -
IV	- - -	- - -	- - -	- - -	- - -
V	- - -	- - -	- - -	- - -	- - -
VI	16,319	962	153	14,631	573
VII	18,625	1,476	152	16,997	- - -
VIII	1,635	- - -	323	1,312	- - -

Figures

Figure 1. In the foreground, typical area of the Epitaph very cobbly clay loam, 3 to 15 percent slopes, in the background, to the left, is map unit Graham - Lampshire complex, 15 to 30 percent slopes.

Figure 2. Typical landscape of the Combate loamy sand, 0 to 3 percent slopes in the foreground. The hill in the background is Mabray - Rock outcrop complex, 3 to 15 percent slopes.

Figure 3. Typical landscape of the Sutherland - Mule complex, 8 to 15 percent slopes. The hill in the background is Mabray - Rock outcrop complex, 15 to 45 percent slopes.

Figure 4. Typical profile of the Mule very gravelly fine sandy loam in an area of Sutherland - Mule complex, 8 to 15 percent slopes.

Figure 5. Typical landscape of the Sutherland very gravelly fine sandy loam, 3 to 8 percent slopes. The mountain in the background is Budlamp - Woodcutter complex, 30 to 60 percent slopes.

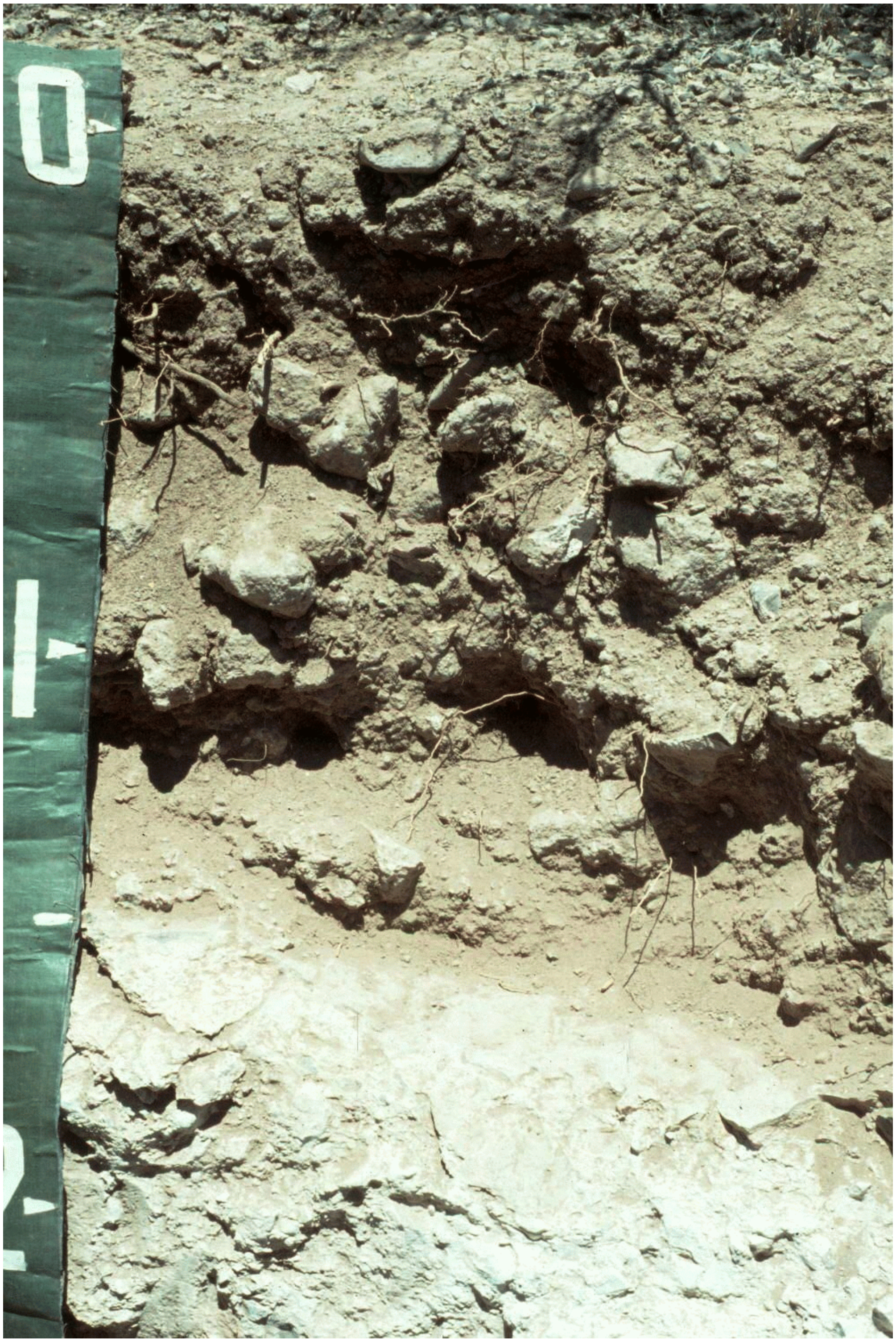


Figure 6. Typical profile of the Sutherland very gravelly fine sandy loam, 3 to 8 percent slopes.

Figure 7. Typical landscape of the Elgin - Stronghold complex, 8 to 15 percent slopes.

Figure 8. Typical profile of the Elgin very gravelly fine sandy loam, in an area of Elgin - Stronghold complex, 8 to 15 percent slopes.

Figure 9. Typical landscape of the Riverwash - Bodecker complex, 0 to 3 percent slopes.

Figure 10. Typical profile of the Bodecker loamy fine sand, in an area of Riverwash - Bodecker complex, 0 to 3 percent slopes.

Figure 11. Typical landscape of the McAllister - Stronghold complex, 3 to 8 percent slopes. The mountain in the background is Budlamp - Woodcutter complex, 30 to 60 percent slopes.

Figure 12. Typical profile of the McAllister gravelly fine sandy loam.

Figure 13. Typical profile of the Stronghold very gravelly loamy sand.

Figure 14. Typical landscape of the Luckyhills - McNeal complex, 3 to 8 percent slopes. The hill in the background is Lampshire - Rock outcrop complex, 15 to 60 percent slopes.

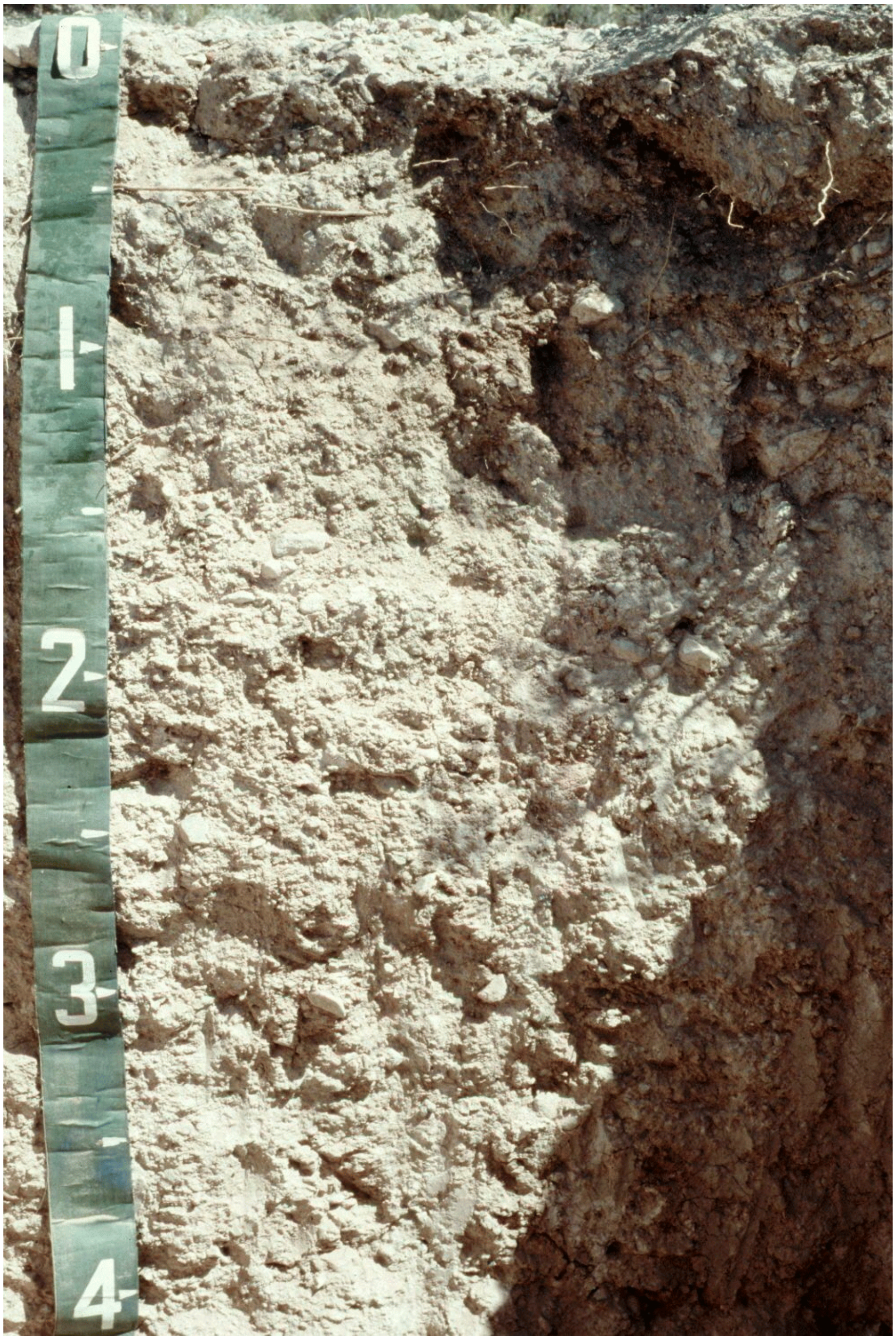


Figure 15. Typical profile of the Luckyhills very gravelly sandy loam.

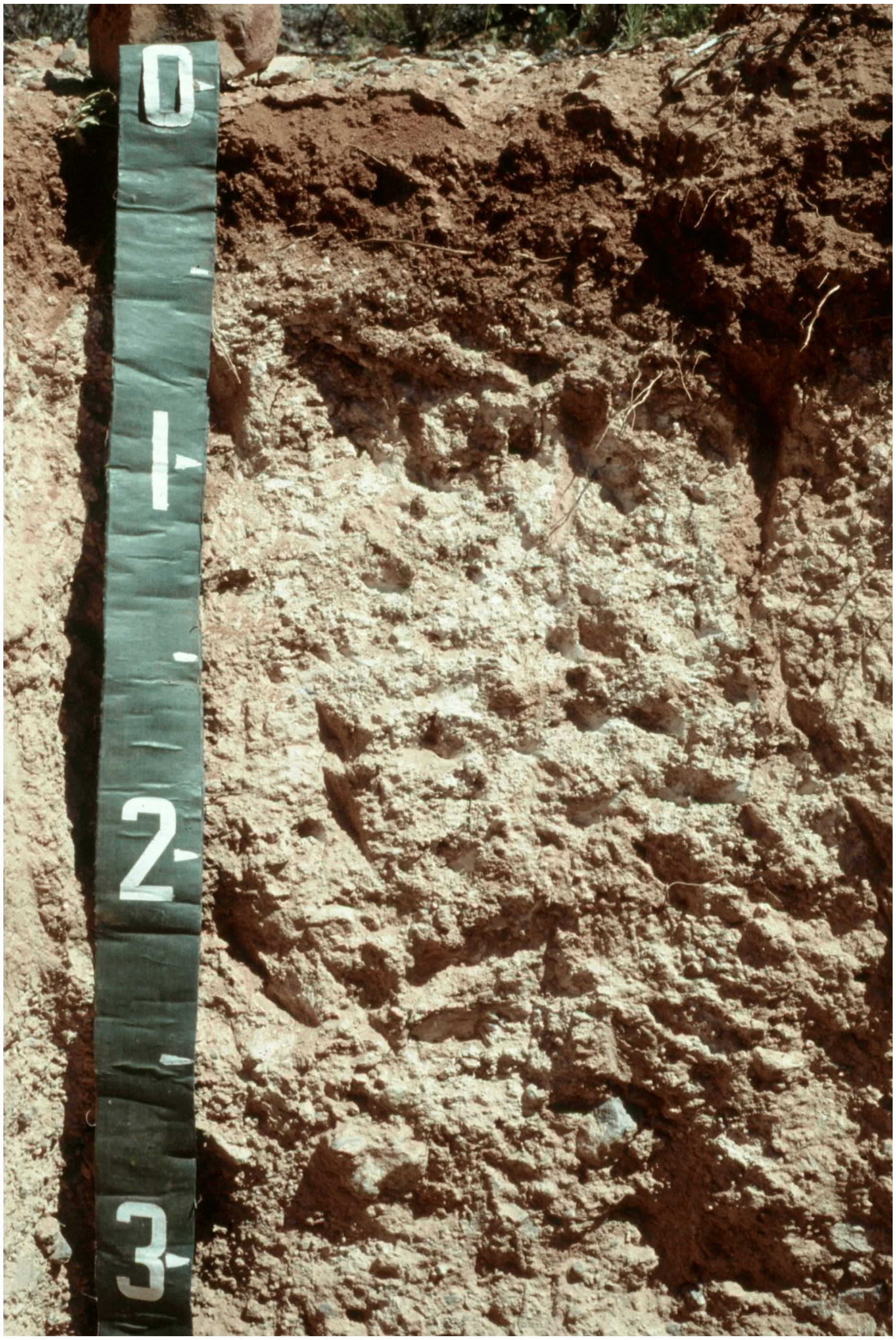


Figure 16. Typical profile of the McNeal very gravelly sandy loam.

Figure 17. Landscapes of the Grizzle coarse sandy loam, 3 to 8 percent slopes, the Forrest - Bonita complex, 0 to 3 percent slopes (light colored grassy area) and in the far background Sutherland - Mule complex, 8 to 15 percent slopes.

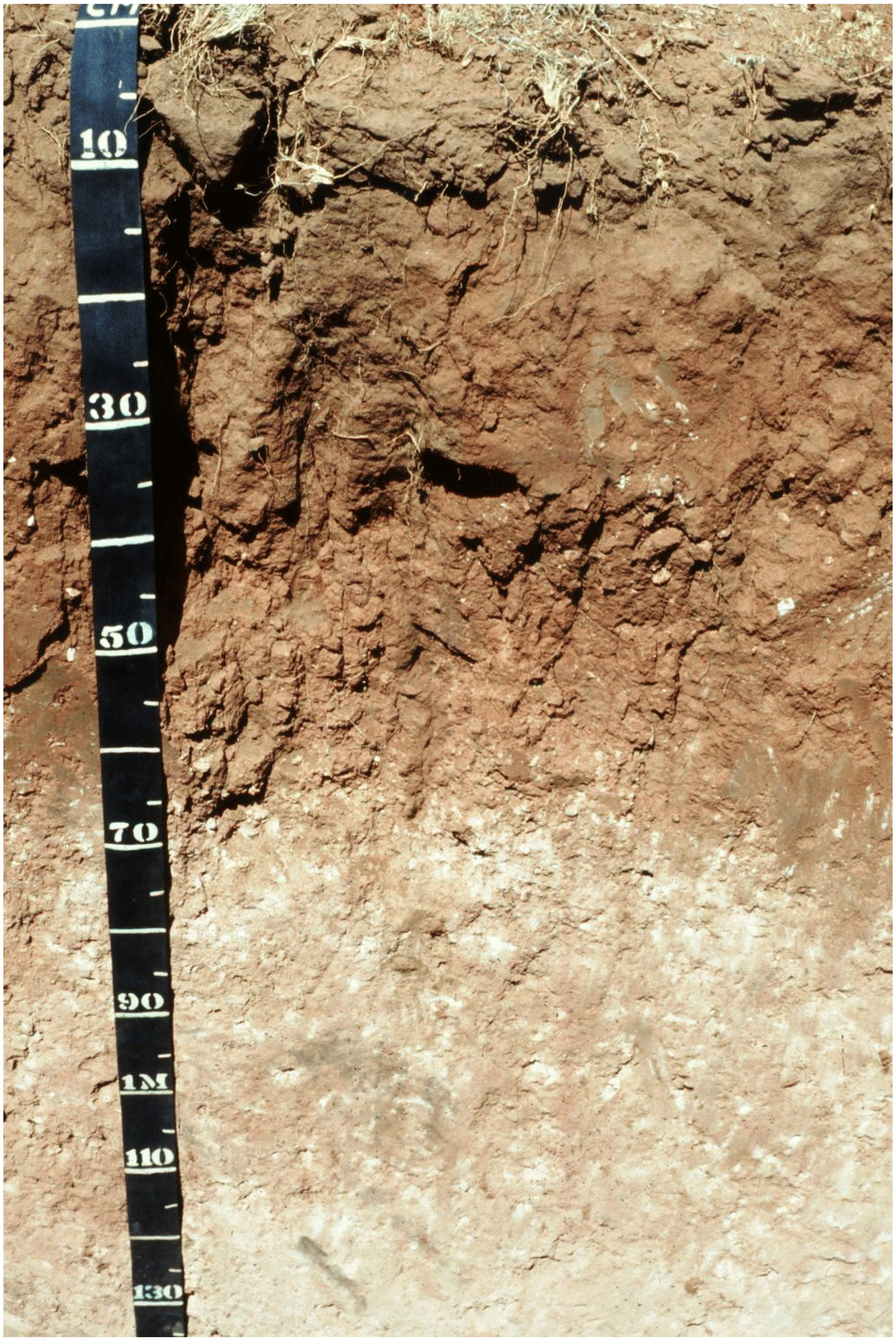


Figure 18. Typical profile of the Forrest fine sandy loam.

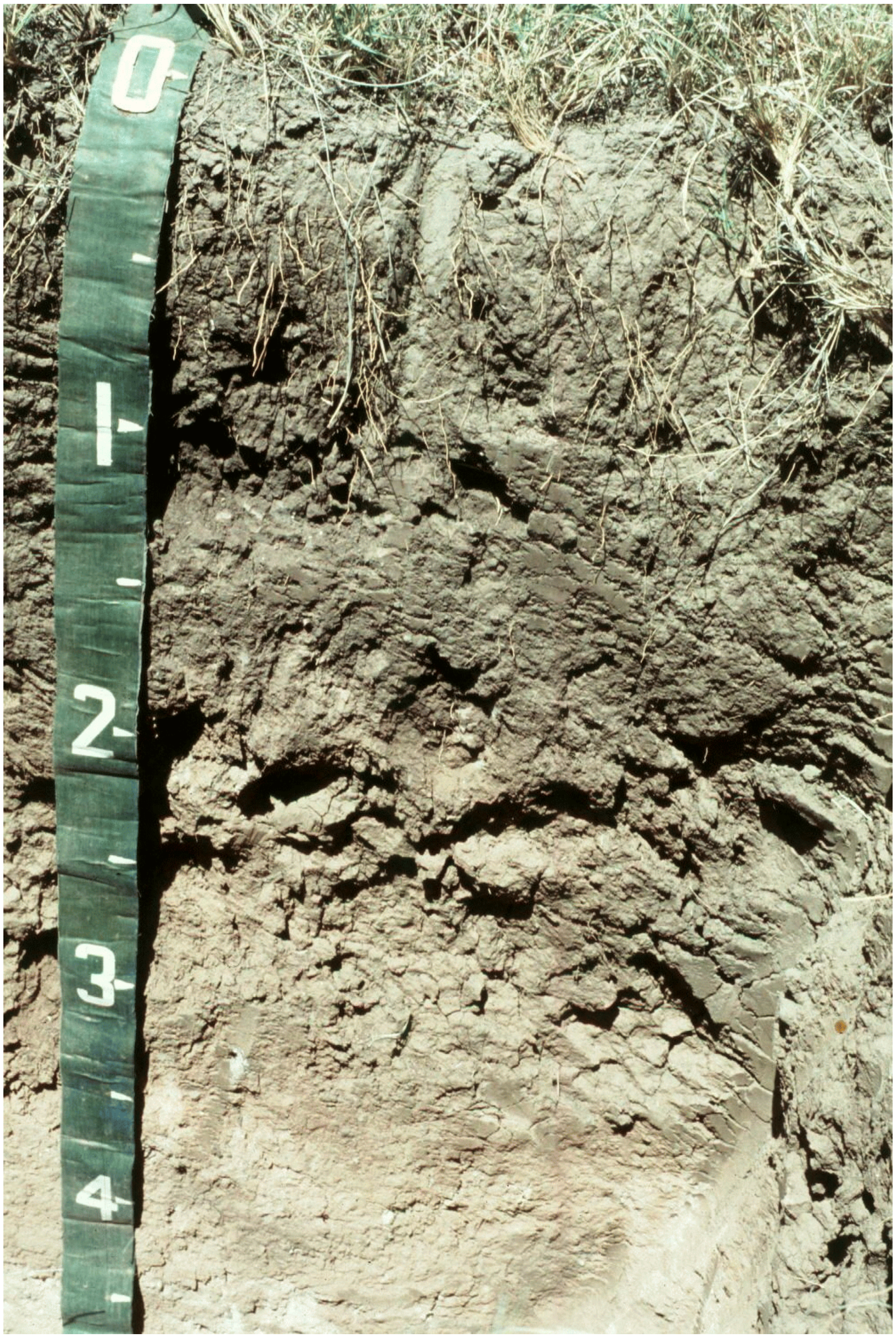


Figure 19. Typical profile of the Bonita silt loam.

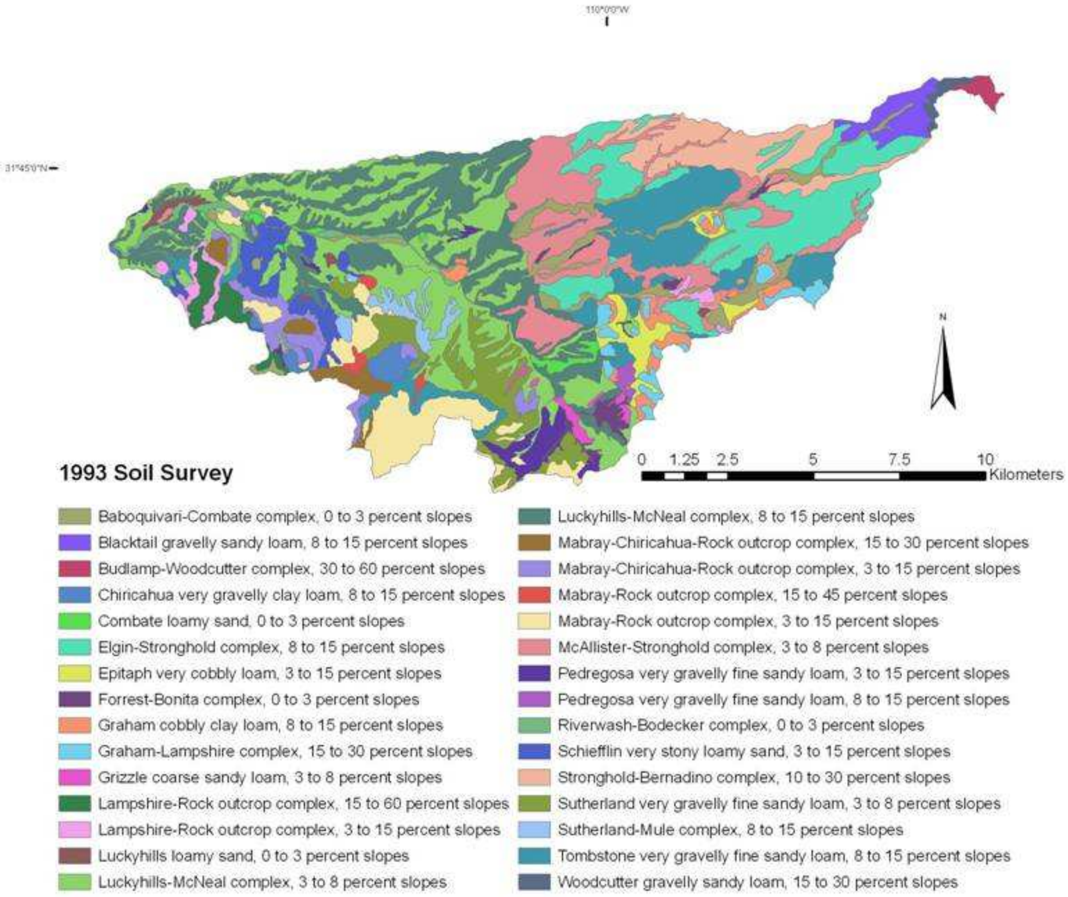


Figure 20. Soils Map Walnut Gulch Experimental Watershed 1993

ADDENDUM

The soil survey of the Walnut Gulch Experimental Watershed was originally published in 1970. This survey was evaluated in several areas to see if the update was needed including soil interpretations, taxonomy, map units and maps. Information in the published survey was found to be outdated and no longer met the current needs of its users. An evaluation found that an update was necessary due to advances in soil taxonomy, new understanding of temperature and precipitation regimes, revised interpretational needs, including the WEPP project, and the need for more detailed soils information.

In 1992-93 soils investigations were conducted to improve the quality of interpretations and soils information. The present report meets these goals and addresses the concerns of the users.

Soil interpretations were updated to account for land use changes and increased knowledge about soil response to different uses and management.

The national soil classification system is dynamic. As new facts accumulate and as soils are mapped and described in new locations, amendments are required to update the system. The types of amendments that have been made are as follows: addition and deletion of taxa, changes in definitions of taxa, changes in definitions of diagnostic criteria, additions of diagnostic criteria, and clarification of the text. Recent changes in soil taxonomy found that concepts of the taxonomic units were not adequate in defining soil map units or in supporting soil interpretations. To accommodate taxonomic changes many new soil series were established.

The following are conversion legends from the 1970 soil survey to the present survey for series names and map unit symbols.

Soil Series Conversion Legend Present To The 1970 Report

Present	1970 Report
Baboquivari	Sonoita
Bernardino	same
Blacktail	Bernardino
Bodecker	sandy alluvial land
Bonita	Guest, loamy alluvial land
Budlamp	Faraway
Chiricahua	same
Combate	Comoro, loamy alluvial land
Elgin	Bernardino
Epitaph	Rimrock
Forrest	McCellan
Graham	same
Grizzle	Courthouse
Lampshire	House Mountain
Luckyhills	Rillito, Nickel
Mabray	Tortugas
McAllister	Bernardino
McNeal	Karro, Laveen
Mule	Hathaway, Rillito
Schiefflin	Cellar
Stronghold	Hathaway
Sutherland	Cave, Kimbrough
Tombstone	Hathaway, Nickel
Woodcutter	Faraway

Walnut Gulch Experimental Watershed , Arizona

Selected Soil Pedon Descriptions, Physical and Chemical Properties

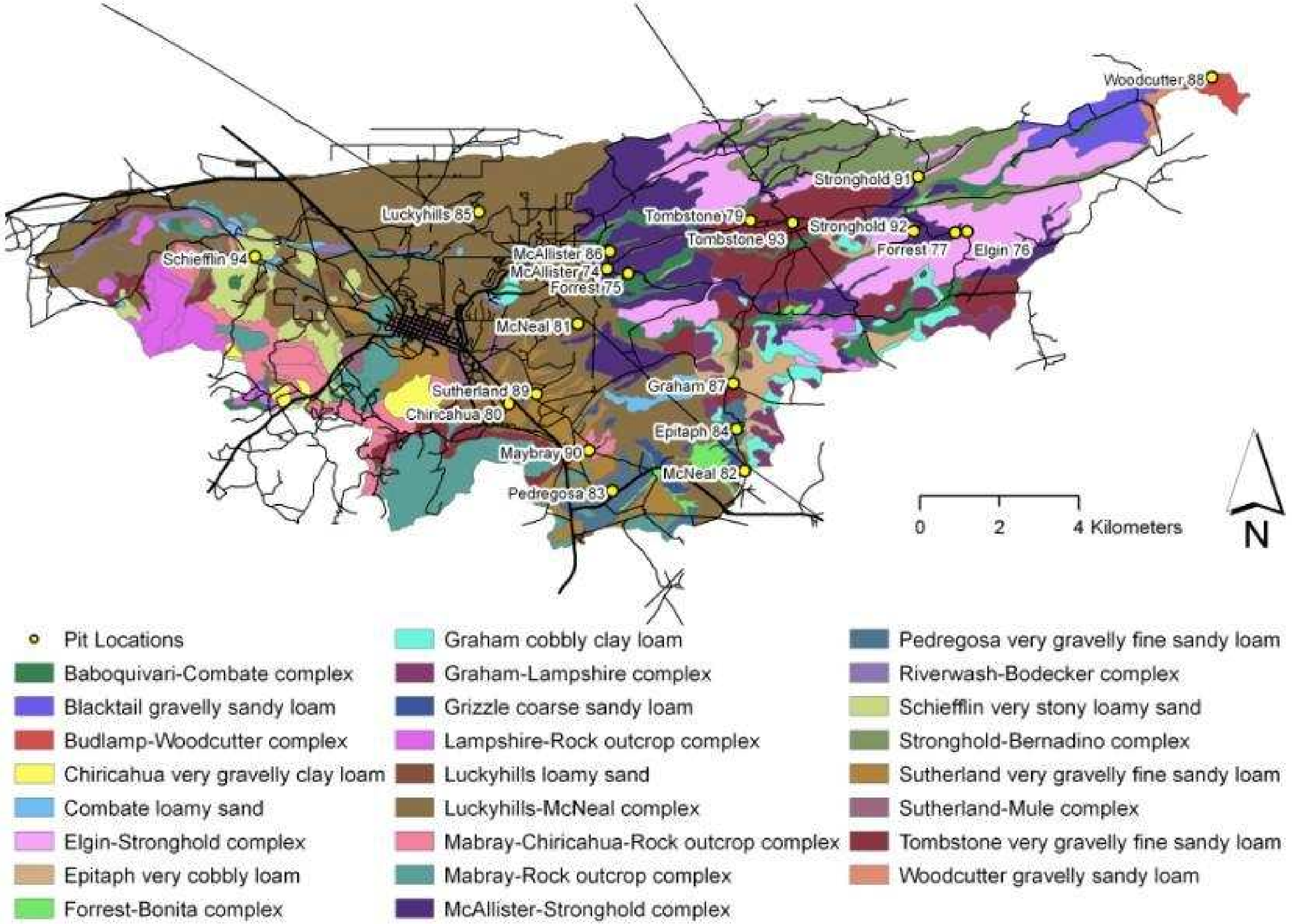
In 1985 Soil Conservation Service (SCS) and USDA-ARS Southwest Watershed Research Center (SWRC) personnel described and sampled twenty-one soil pedons on Walnut Gulch Experimental Watershed (WGEW). For some pedons, complete profile samples were split in half and sent to the National Soil Survey Laboratory (NSSL) for more complete analysis. The split samples and all other pedons were analyzed at the SWRC. Pedons that were split sampled can be identified by the -2 added to the pedon number and the -2 data was analyzed at the SWRC, except samples from greater than 10 cm depth which were sent to the NSSL for selective 1/3 bar and oven dry bulk density, Coefficient of Linear Extensibility (COLE), and 15 bar water content analysis. Codes are in the data just above the units to identify the laboratory procedure used, codes and laboratory procedures are given in Soil Survey Laboratory Methods Manual at: http://soils.usda.gov/technical/lmm.

The data and soil pedon and landscape pictures are presented on pages 200-295.

The Luckyhills soil series was sampled and analyzed in 1999 by the NSSL and the data is presented on pages 296-310.

Analysis of some soil series on WGEW is presented in Tables 1 & 2 pages 311-312.

Soil Pedon Pit Locations on Walnut Gulch Experimental Watershed



```
                              ***  P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-074 (Pedon 074)                          (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : McALLISTER                ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGIDE
REVISED TO    :                           ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 821, SAMPLES 86P4955-4958                                                        SOIL CONSERVATION SERVICE
Location
Latitude: 31-43-39.20-N                                                     Longitude: 110-01-25.79-W
Elevation: 1379 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-------- ----------------------------------------------------------------------------------------------------------------------------
                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH    HORIZON    LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2    5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

          0- 1     A1         14.1 16.0  69.9                            5.7   13.7   17.7 14.7 17.7 20.1 26.4 0.0    0.0   47.0
          1- 10    A2         22.1 16.0  61.8                            5.1   12.1   14.1 11.1 19.2 19.1 24.4 0.0    0.0   44.0
86P4955S  10-28    BT1        31.5 14.7  53.9                            5.8   9.7     9.8 9.7  18.8 22.7 16.4 0.0    0.0   39.0
86P4956S  28-48    BT2        27.5 11.3  61.2                            5.0   11.0   13.0 12.0 20.0 26.9 14.7 0.0    0.0   42.0
          48-102   2BK        12.8 12.7  74.5                            7.3   16.3   16.3 14.3 20.3 22.7 14.9 0.0    0.0   38.0
86P4957S  102-124  3CK1       12.1 26.0  61.9                            8.2   16.2   12.1 11.2 14.2 17.4 14.0 0.0    0.0   32.0
86P4958S  124-152  3K2        12.8 10.0  77.2                            6.8   16.8   17.8 15.8 19.8 31.0 12.6 0.0    0.0   44.0

-------- ----------------------------------------------------------------------------------------------------------------------------
           ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15    - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                               FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
  (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
         <-PCT   PCT    PCT    PERCENT  OF  <2MM -->           PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 1      0.89  0.37  0.015
  1- 10     1.60  0.40  0.016                                                 1.33
 10- 28     1.67  0.43  0.016                                                       1.27  1.42  0.038              21.0
 28- 48     0.86  0.42  0.018                                                       1.36  1.48  0.029              21.8
 48-102     0.16  0.20  0.013
102-124     0.08  0.25  0.016                                                       1.75  1.78 0.006               10.2
124-152     0.06  0.23  0.008                                                       1.85  1.89 0.007                6.2
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-074
SAMPLED AS    : McALLISTER           ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGIDE
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 821, SAMPLE 86P4955-4958

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-------- ----------------------------------------------------------------------------------------------------------------------------------
           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                           PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                       8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0- 1       28.5 0.67  0.02 0.86                            32.3       860  4.25 0.45 0.65 0.41 0.034 0.24 1.04  0.35 0.93 1.80   7.64
  1- 10      34.2 1.21  0.21 1.48                            48.5       863  4.23 0.49 0.22 0.36 0.091 0.26 1.04  0.35 0.60 1.75   7.83
 10- 28      34.2 0.71  0.07 0.85                            44.4       798  3.99 0.35 0.23 0.14 0.030 0.20 1.07  0.31 0.37 1.68   7.46
 28- 48      39.8 0.86  0.13 1.08                            36.7       754  4.05 0.34 0.34 0.13 0.044 0.15 0.66  0.77 0.42 1.45   7.56
 48-102      28.5 0.99  0.14 0.50                            23.3       840  3.99 0.60 0.70 0.17 0.017 0.29 0.54  1.92 0.31 1.36   7.57
102-124      27.2 1.07  0.15 0.40                            18.3       920  3.86 0.65 0.85 0.19 0.009 0.19 0.47  1.54 0.29 1.33   7.60
124-152      25.6 2.00  0.46 0.58                            28.5       918  2.39 0.59 1.53 0.17 0.009 0.27 1.02  2.04 0.27 1.21   7.38

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        ANALYSES:  S= ALL ON SIEVED <2MM BASIS
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NARRATIVE PEDON DESCRIPTION

Pedon: McAllister NSSL Pedon Number: 86P0821
Soil Survey Number S85-AZ-003-074
Location: Cochise County, Arizona
1050 ft E and 955 ft S of NW corner of Sec. 5, T.20S., R.23E. Approximate
Latitude: 31-43-39.20-N Longitude: 110-01-25.79-W
Physiography: terracettes in
Slope: 12% convex southeast facing Elevation: 1379 m MSL
Precipitation: cm - Aridic Moisture Regime.
MLRA: 90 Central Wisconsin and Minnesota Thin Loess and Till
Water Table Depth: 0 Permeability: Moderate
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: McAllister ; Fine-loamy, mixed, superactive, thermic Ustic Calciargide
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich Dr. Grossman Sample Date: 23 Oct 1985
South of gravel storage area at intersection of Cowan Ranch and Gleason Raods. 85% of the surface is covered by rock fragments; about 10% cobbles.

A1 -- 0 to 1 cm; brown (7.5YR 5/2) dry gravelly sandy loam; dark brown (7.5YR 3/2) moist; weak coarse platy structure;slightly hard, friable, nonsticky, nonplastic; common fine vesicular pores; strongly effervescent; moderately alkaline (pH=8.2);abrupt smooth boundary.

A2 -- 1 to 10 cm; brown (7.5YR 5/2) dry very gravelly sandy loam; dark brown (7.5YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; common fine interstitial pores and; strongly effervescent; strongly alkaline (pH=8.4); 65 percent pebbles; abrupt smooth boundary.

Bt -- 10 to 28 cm; dry very gravelly sandy clay loam; brown to dark brown (7.5YR 4/4) and reddish brown (5YR 4/4) moist; moderate very fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few fine tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 35 percent pebbles; abrupt wavy boundary. Thin discontinuous clay films on faces of peds.

Btk -- 28 to 48 cm; dry very gravelly sandy clay loam; dark red (2.5YR 3/6) moist; weak medium subangular blocky structure;very hard, friable, slightly sticky, slightly plastic; few fine tubular pores and; strongly effervescent; strongly alkaline (pH=8.4); 40 percent pebbles; clear wavy boundary. Common fine irregular lime masses. Thin discontinuous clay films on faces of peds.

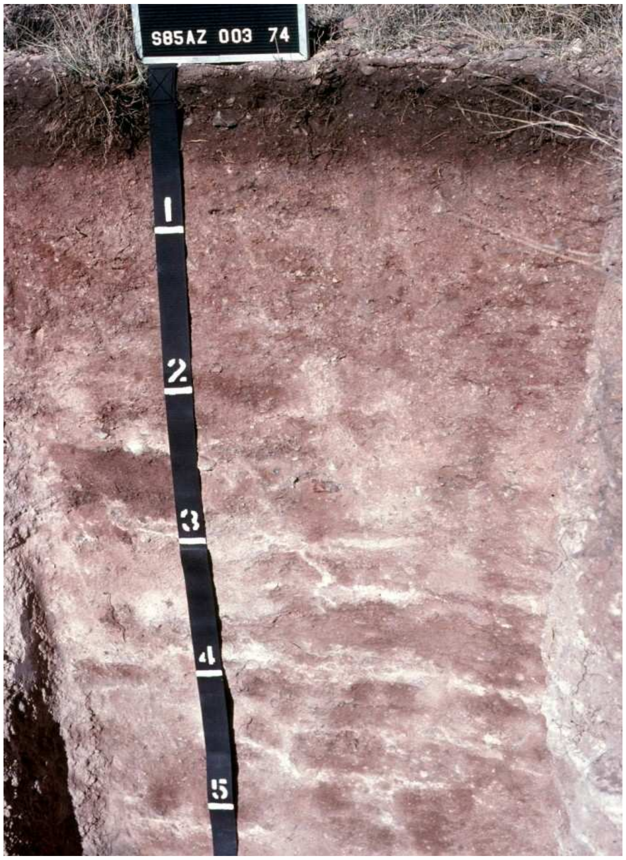
2Bk -- 48 to 102 cm; dry very gravelly sandy loam; pink (7.5YR 7/4) moist; slightly hard, friable, slightly sticky, nonplastic; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 50 percent pebbles; clear wavy boundary. Many large irregular lime masses and nodules.

3Ck1 --102 to 124 cm; dry very gravelly sandy loam; (7.5YR 7/3) gray moist; hard, friable, weakly cemented, nonsticky, nonplastic; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Many large irregular lime masses and nodules.

3Ck2 --124 to 152 cm; dry very gravelly sandy loam; pink (7.5YR 7/4) moist; slightly hard, friable, nonsticky, nonplastic; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary.

3Ck3 --152 to 152 cm; dry.


S85AZ 003 74
1
2
3


S85AZ 003 74
1
2
3
4
5

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-075 (Pedon 75)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : FORREST              ; FINE, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                           U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 822, SAMPLES 86P4959-4963                                                   SOIL CONSERVATION SERVICE
Location:
Latitude: 31-43-35.60-N                                                Longitude: 110-01-8.38-W
Elevation: 1389 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                          NATIONAL SOIL SURVEY LABORATORY
                                                                                               LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT  .002  .02   .05   .10   .25    .5     1     2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0- 5     A1          15.5  18.7  65.9                                16.4  21.4  13.4  7.4   7.4   5.5  20.6  24.1   0.0   50
86P4959S 5- 13    BT1         30.1  16.0  53.9                                11.0  13.0  9.0   9.0   12.0  15.5  11.9  1.0    0.0   28
86P4960S 13- 30   BT2         33.5  16.0  50.3                                6.1   9.1   8.1   10.1  17.1  23.0  12.3  1.0    0.0   37
         30- 43   BT3         29.5  22.0  48.5                                7.9   8.9   8.9   9.9   12.9  21.4  23.7  0.0    1.0   45
86P4961S 43- 64   2BTK        24.8  24.7  50.5                                9.1   9.1   10.1  9.1   13.1  18.4  16.9  1.0    0.0   36
86P4962S 64- 97   2BK1        19.5  24.0  56.5                                10.9  10.9  10.9  10.9  12.9  17.4  13.8  0.0    0.0   32
         97- 145  2BK2        18.8  26.7  54.5                                8.9   8.9   11.9  10.9  13.9  15.2  9.2   0.0    0.0   25
86P4963S 145-201  3BK3        36.8  45.3  17.9                                6.4   3.4   3.4   2.4   2.4   17.3  1.9   0.0    0.0   20

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15    - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A3A  4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
         <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 5     0.39 0.23  0.007                                                1.39
  5- 13    0.83 0.34  0.001                                                      1.56 1.67  0.023              13.5
  13- 30   0.75 0.38  0.014                                                      1.61 1.76  0.030              14.6
  30- 43   0.46 0.30  0.017
  43- 64   0.24 0.69  0.014                                                      1.57 1.57                     12.5
  64- 97   0.12 0.21  0.010                                                      1.61 0.68  0.014              10.5
  97- 145  0.07 0.17  0.010
  145-201  0.06 0.19  0.013                                                      1.37 1.56  0.044              27.5
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                    ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-075
SAMPLED AS    : FORREST              ; FINE, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 822, SAMPLE 86P4959-4963

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K  SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                          PASTE
 (CM)       6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                      8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0-  5     2.08 0.86  0.01 0.99                        20.4        977  3.54  0.94  0.26  0.59  0.052  0.30  1.25   0.93  0.35  2.03   7.95
  5-  13    8.72 2.78  0.08 0.93                        55.1        870  3.56  0.81  0.33  0.19  0.093  0.21  0.79   0.83  0.40  1.56   7.84
  13- 30    23.0 3.73  0.13 0.93                        59.7        895  3.70  0.74  0.59  0.19  0.068  0.17  1.07   1.19  0.46  1.44   7.55
  30- 43    30.9 3.66  0.17 0.88                        43.0        870  4.30  0.82  0.50  0.20  0.054  0.14  0.46   1.31  0.39  1.44   7.69
  43- 64    30.9 4.57  0.21 0.94                        38.6      19000  3.47  1.05  0.75  0.27  0.049  0.36  1.31   1.58  0.46  1.50   7.60
  64- 97    28.5 5.50  0.41 1.02                        51.4      1280   3.06  1.20  1.40  0.37  0.061  0.35  0.41   3.23  0.47  1.32   7.10
  97- 145   26.7 7.01  1.03 1.02                        42.1       6900  7.44  4.84  12.3  0.63  0.033  0.31  0.25   7.46  5.63  1.24   7.44
  145-201   15.8 9.51  3.49 2.38                        40.8       5250  4.89  4.09  20.8  0.80  0.598  0.21  3.08   6.61  18.6  1.10   7.65
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NARRATIVE PEDON DESCRIPTION

Pedon: Forrest NSSL Pedon Number: 86P0822
Soil Survey Number S85-AZ-003-075
Location: Cochise County, Arizona
1260' S and 2625' E of NW corner of Sec. 5, T.20S., R.23E. Approximate
Latitude: 31-43-35.60-N Longitude: 110-01-8.38-W
Physiography: terracettes in
Slope: 4% convex northeast facing Elevation: 1389 m MSL
Precipitation: cm - Aridic Moisture Regime.
MLRA: 50
Water Table Depth: 0 Permeability: Moderate
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Fine, mixed, superactive, thermic Ustic Calciargid
Diagnostic Horizons:
Described By: Carl Glocken, Dr. William Emmerick Dr. Grossman Sample Date: 22 Oct 1985
50% of surface covered by rock fragments, mostly pebbles.

A1 -- 0 to 5 cm; brown (7.5YR 5/4) dry sandy loam; dark brown (7.5YR 3/4) moist; weak coarse platy structure; soft, very friable, nonsticky, nonplastic; many medium roots; many medium vesicular pores; mildly alkaline (pH=7.5); abrupt wavy boundary.

Bt1 -- 5 to 13 cm; reddish brown (5YR 4/3) dry gravelly sandy clay loam; dark reddish brown (5YR 3/4) moist; moderate very fine subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many medium roots; few medium interstitial pores and; mildly alkaline (pH=7.6); 22 percent pebbles; abrupt wavy boundary.

Bt2 -- 13 to 30 cm; (2.5YR 4/3) brown dry gravelly sandy clay loam; dark reddish brown (2.5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable, sticky, plastic; common medium roots; few medium interstitial pores and; mildly alkaline (pH=7.4); 25 percent pebbles; clear wavy boundary. Thin discontinuous clay films on faces of peds.

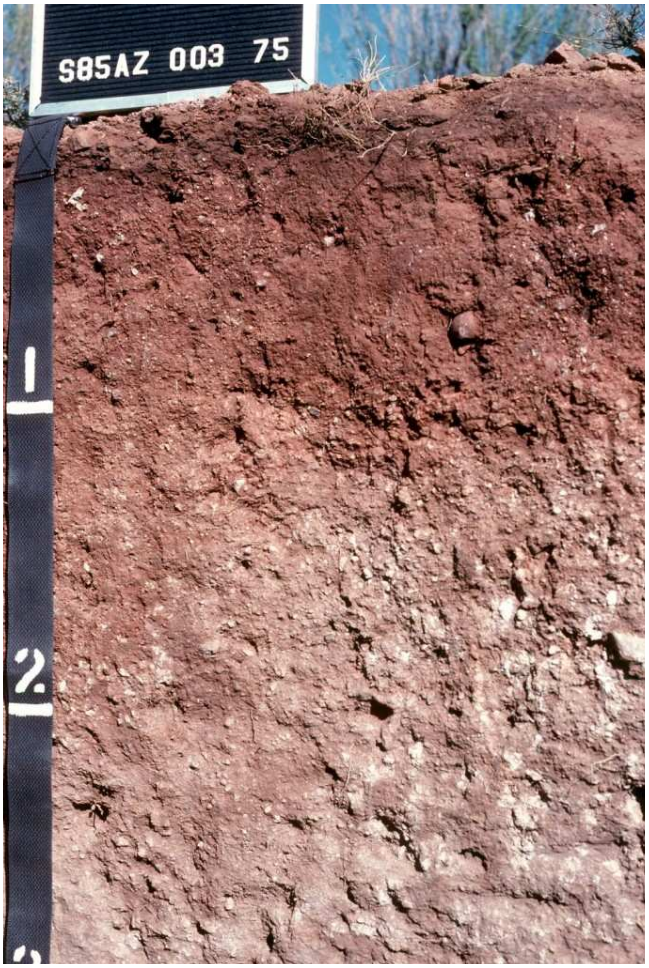
Bt3 -- 30 to 43 cm; red (2.5YR 4/6) dry gravelly sandy clay loam; dark red (2.5YR 3/6) moist; moderate fine subangular blocky structure; hard, firm, sticky, plastic; few medium roots; few fine interstitial pores and; mildly alkaline (pH=7.6); 30 percent pebbles; clear wavy boundary. Thin discontinuous clay films on faces of peds.

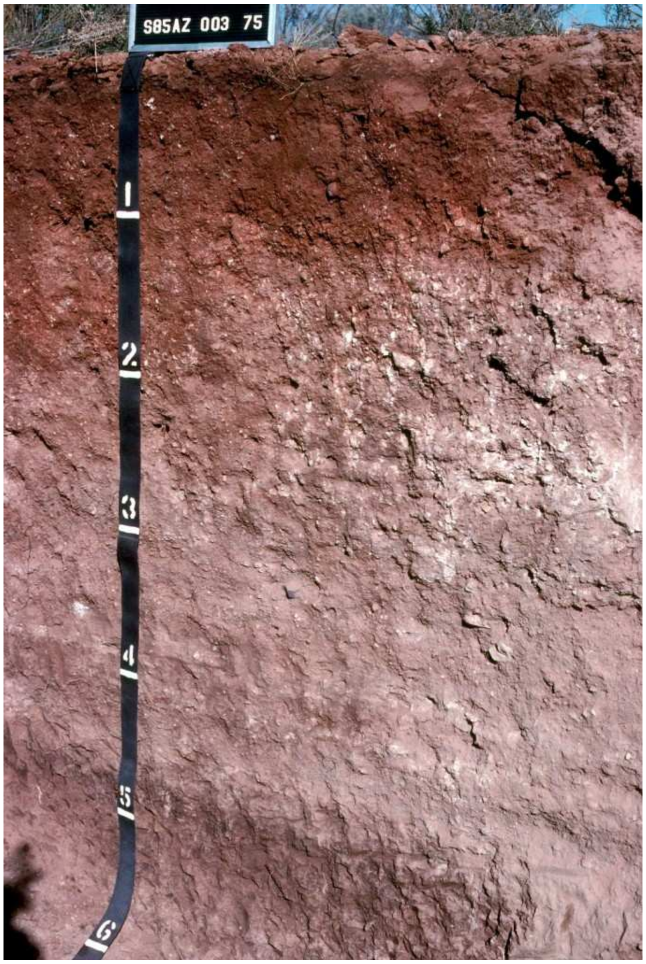
2Btk -- 43 to 64 cm; reddish brown (5YR 5/4) dry gravelly loam; reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few fine roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 20 percent pebbles; clear wavy boundary. Thin patchy clay films on faces of peds; thin continuous lining pores. Few fine rounded lime masses; lime coats on undersides of pebbles.

2Bk1 -- 64 to 97 cm; light reddish brown (5YR 6/3) dry gravelly sandy loam; reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; few fine roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 20 percent pebbles; clear wavy boundary. Few fine rounded lime masses; Lime coats on undersides of pebbles.

2BK2 -- 97 to 145 cm; light reddish brown (5YR 6/3) dry gravelly sandy loam; reddish brown (5YR 5/4) moist; soft, very friable, nonsticky, nonplastic; few fine roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 33 percent pebbles; clear wavy boundary. Lime accumulations in root channels and pores; as thin coats on the undersides of rock fragments.

3Bk3 --145 to 201 cm; brown (7.5YR 5/4) dry silt loam; brown (7.5YR 5/4) moist; weak medium prismatic structure parting to weak fine angular blocky; very hard, firm, slightly sticky, slightly plastic; few fine roots; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4). (10YR 2/2) Mn coats, very patchy on ped faces, lining pores and root channels.


S85AZ 003 75
1
2


S85AZ 003 75
1
2
3
4
5
6

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-076 (Pedon 76)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : ELGIN                ; FINE, MIXED, SUPERACTIVE, THERMIC CALCIC PALEARGID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                        U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 823, SAMPLES 86P4964-4968                                                SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-09.72-N                                                   Longitude: 109-56-31.87-W
Elevation : 1535 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                       NATIONAL SOIL SURVEY LABORATORY
                                                                                            LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0- 5     A           23.5  9.3   67.2                                13.8  32.8  9.8   4.8   5.8   8.1   15.5  13.8  0.0   37
         5- 13    BW1         32.1  12.7  55.2                                10.4  21.4  7.4   5.4   10.4  14.7  19.7  21.7  0.0   56
86P4964S 13- 25   BW2         36.1  13.3  50.5                                7.7   18.7  7.7   5.7   10.7  20.9  18.1  1.0   0.0   40
86P4965S 25- 43   2BK1        26.8  17.3  55.9                                7.7   26.8  8.8   4.7   7.8   19.1  4.5   0.0   0.0   24
86P4966S 43- 56   2BK2        19.5  21.3  59.2                                10.2  32.2  10.2  3.2   3.2   4.5   0.3   0.0   0.0   5
         56- 75   2CK1        18.8  26.0  55.2                                12.8  21.8  8.8   5.8   5.8   8.6   4.3   0.0   0.0   17
86P4967S  75-102  2CK         16.8  27.3  55.9                                12.1  18.2  9.2   8.2   8.2   8.2   1.7   0.0   0.0   10
86P4968S 100-145  2C1         10.8  21.3  67.9                                17.2  32.2  8.2   5.2   5.2   7.8   4.4   0.0   0.0   12
         145-225  2C2         10.1  17.3  72.5                                11.1  33.1  12.1  9.1   7.1   8.0   7.7   20.0  1.0   36
         225-255  2C3         8.8   12.7  78.5                                11.5  23.5  17.5  12.5  13.5  14.7  23.4  0.0   0.0   38

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 5      0.49  0.32  0.014                                               1.19
  5- 13     1.58  0.40  0.014
  13- 25    1.04  0.35  0.011                                                     1.39  1.55  0.037             20.3
  25- 43    0.45  0.33  0.014                                                     1.55  1.61  0.013             13.3
  43- 56    0.27  0.22  0.013                                                     1.46  1.48  0.005             14.3
  56- 75    0.17  0.19  0.016
  76-102    0.14  0.17  0.014                                                     1.34  1.35  0.040             22.9
  102-145   0.07  0.19  0.020                                                     1.67  1.72  0.010             11.8
  145-225   0.04  0.19  0.019
  225-255   0.04  0.21  0.022
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        AVERAGES,   DEPTH  25-100:  PCT CLAY    0  PCT  .1-75MM     0
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-076
SAMPLED AS    : ELGIN                ; FINE, MIXED, SUPERACTIVE, THERMIC CALCIC PALEARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 823, SAMPLE 86P4964-4968

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                           PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                       8C1B
            <- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   /CM  <------------------MEQ/L--------->< UEQ/L> <---–MEQ/L----->
  0- 5      31.0 1.03  0.07 1.05                          42.4       657  3.14 0.44 0.05 0.28 0.043 0.21 1.10  0.35 0.32 1.31  7.82
  5- 13     36.2 1.25  0.24 1.01                          73.4       738  4.03 0.41 0.27 0.29 0.037 0.20 0.93  0.52 0.38 1.65  7.84
  13- 25    39.6 1.46  0.07 0.80                          56.9       790  4.13 0.40 0.48 0.23 0.021 0.19 0.73  0.72 0.43 1.33  7.86
  25- 43    34.0 1.09  0.09 0.66                          40.4       695  2.32 .026 0.25 0.08 0.014 0.21 1.06  0.81 0.26 0.35  7.92
  43- 56    32.6 0.96  0.14 0.56                          45.2       864  3.73 0.48 0.48 0.51 0.029 0.29 4.52  1.64 0.29 1.31  7.88
  56- 75    31.0 1.87  0.49 0.54                          43.2      1920  8.06 1.05 2.16 0.24 0.015 0.29 1.09  6.53 0.27 1.11  7.76
  75-102    31.0 3.12  1.36 0.54                          53.3      3500  10.6 1.32 6.08 0.40 0.006 0.24 2.35  7.32 0.43 1.20  7.72
  102-145   28.6 4.00  1.85 1.20                          53.3      5220  8.22 1.31 17.7 0.87 0.162 0.60 1.20  7.27 3.39 1.14  7.81
  145-225   26.6 4.06  1.67 0.94                          56.9      6330  8.43 36.2 19.5 0.91 0.150 0.22 0.60  6.31 23.3 0.99  7.60
  225-255   24.6 4.10  1.29 0.68                          26.3      4960  7.83 3.49 18.0 0.71 0.089 0.26 4.34  4.30 23.3 0.83  7.65
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NARRATIVE PEDON DESCRIPTION

Pedon: Elgin NSSL Pedon Number: 86P0823
Soil Survey Number S85-AZ-003-076
Location: Cochise County, Arizona
500' N of R.G. 82, 2325' N of 440' W of the SE corner of Sec. 36, T.19S., R.23E. Approximate
Latitude: 31-44-09.72-N Longitude: 109-56-31.87-W
Physiography: terracettes in
Slope: 8% convex north facing Elevation: 1535 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0 Permeability: Moderately rapid
Drainage: Somewhat excessively drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Fine, mixed, superactive, thermic Calcic Paleargid
Diagnostic Horizons:
Described By: Carl Glocken, Dr. William Emmerich, Dr. Grossman Sample Date: 24 Oct 1985
65% surface covered with rock fragments; mostly pebbles. Some evidence of movement solutes. Coats are patchy; some grains bridged by cutans.

A -- 0 to 5 cm; brown (7.5YR 5/2) dry gravelly sandy loam; brown to dark brown (7.5YR 4/2) moist; weak coarse platy structure; soft, very friable, nonsticky, nonplastic; few medium vesicular pores; moderately alkaline (pH=8.2); abrupt wavy boundary.

Bw1 -- 5 to 13 cm; brown (7.5YR 5/4) dry gravelly sandy loam; (7.5YR 4/3)o dark moist; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium interstitial pores; moderately alkaline (pH=8.2); abrupt wavy boundary.

Bw2 -- 13 to 25 cm; brown (7.5YR 5/4) dry loam; (7.5YR 5/4) (7.54Y R/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine tubular pores and; moderately alkaline (pH=8.2); 2 percent pebbles; abrupt wavy boundary.

2Bk1 -- 25 to 43 cm; light brown (7.5YR 6/4) dry fine sandy loam; brown (7.5YR 5/4) moist; weak very fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few fine tubular pores; strongly alkaline (pH=8.4); abrupt wavy boundary.

2Bk2 -- 43 to 56 cm; light brown (7.5YR 6/4) dry fine sandy loam; brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, firm, nonsticky, nonplastic; few fine interstitial pores; strongly alkaline (pH=8.4); abrupt wavy boundary.

2CK1 -- 51 to 76 cm; pinkish gray (7.5YR 6/2) dry fine sandy loam; light brown (7.5YR 6/4) moist; slightly hard, very friable, slightly plastic, nonplastic; few fine interstitial pores; strongly alkaline (pH=8.4); abrupt wavy boundary.

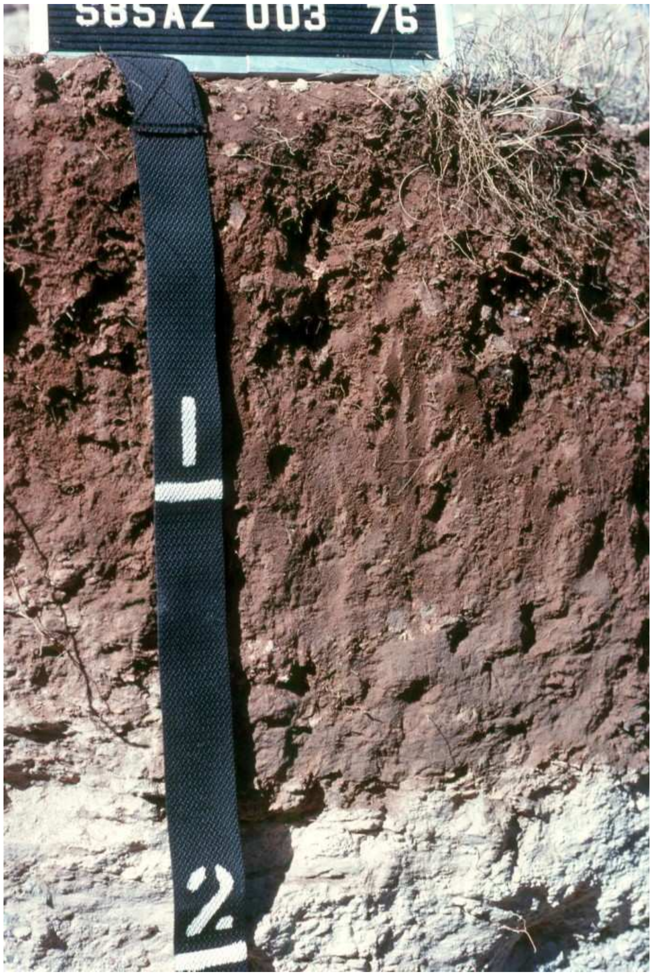
2Ck2 -- 76 to 102 cm; pinkish white (7.5YR 8/2) dry fine sandy loam; pinkish white (7.5YR 8/2) moist; hard, firm, weakly cemented, nonsticky, nonplastic; strongly alkaline (pH=8.4); abrupt wavy boundary.

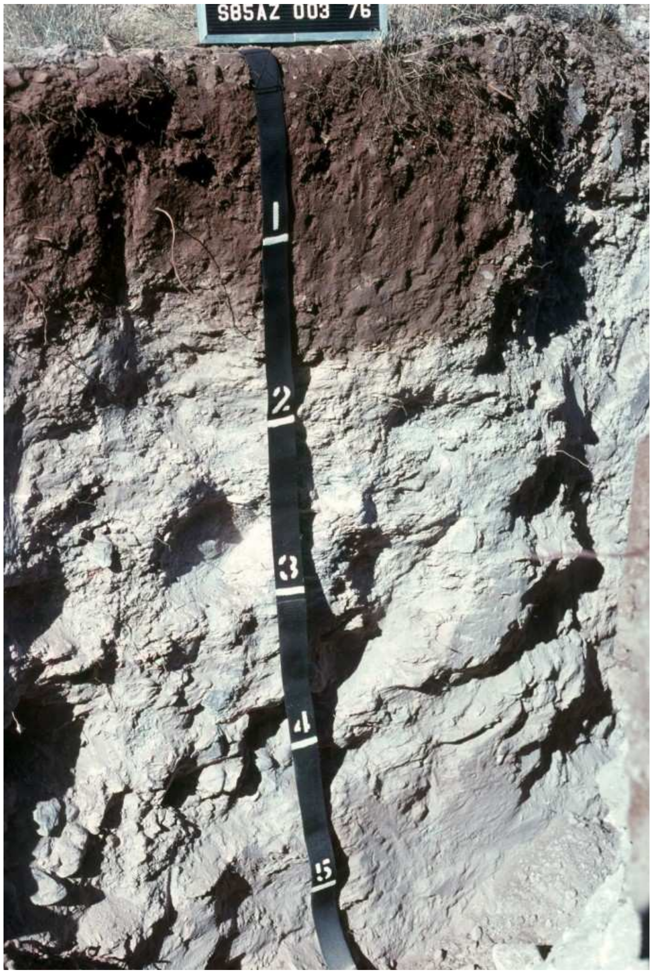
2C1 --102 to 145 cm; pinkish gray (7.5YR 7/2) dry fine sandy loam; dark brown (7.5YR 3/4) moist; hard, very friable, nonsticky, nonplastic; strongly alkaline (pH=8.4).

2C2 --145 to 224 cm; pinkish gray (7.5YR 7/2) dry fine sandy loam; dark brown (7.5YR 3/4) moist; hard, very friable, nonsticky, nonplastic; strongly alkaline (pH=8.4).

2C3 --224 to 254 cm; pinkish gray (7.5YR 7/2) dry fine sandy loam; dark brown (7.5YR 3/4) moist; hard, very friable, nonsticky, nonplastic; strongly alkaline (pH=8.4).

Bw -- 5 to 23 cm; dry. Satellite sample 2 meters from A.


S85AZ 003 76
1
2


S85AZ 003 76
1
2
3
4
5

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-077 (Pedon 77)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : FORREST              ; FINE, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                           U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 824, SAMPLES 86P4969-4974                                                   SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-09.02-N                                                    Longitude: 109-56-41.72-W
Elevation: 1518 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                          NATIONAL SOIL SURVEY LABORATORY
                                                                                               LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5    20    .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
                   A1         20.8  12.7  66.5                             12.5  31.5   9.5   5.5   7.5   4.9   9.5   27.6  0.0   42
86P4969S  1-  8    A2         28.1  24.7  47.2                             11.2  19.2   8.2   4.2   4.2   7.3   3.5   0.0   0.0   11
86P4970S  8- 18    BT1        46.8  10.0  43.2                             7.4   20.4   7.2   4.2   4.2   13.1  1.9   0.0   0.0   16
86P4971S  18- 33   BT2        44.8  9.33  45.9                             9.0   20.0   8.0   5.0   4.0   9.7   1.6   0.0   0.0   12
86P4972S  33- 43   2BTK       35.5  9.33  55.2                             12.4  10.4   10.4  10.4  11.4  23.4  27.0  0.0   0.0   51
86P4973S  43- 61   2BK1       28.1  12.0  59.9                             8.1   16.2   13.2  9.2   13.2  18.5  35.1  6.5   0.0   60
          61- 79   2BK2       12.1  16.7  71.2                             11.2  21.2   16.2  11.2  11.2  14.5  36.5  9.7   0.0   61
86P4974S  79-122   3CK1       10.1  13.3  76.5                             11.7  28.7   16.7  9.7   9.7   12.0  33.4  13.5  0.0   59
          122-160  3CK2       9.47  16.0  74.5                             18.1  29.1   10.1  8.1   9.1   4.7   3.1   24.0  0.0   32
          160-190  3C         8.8   14.0  77.2                             15.6  34.6   11.6  8.6   6.6   10.2  18.2  1.0   0.0   30
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15    - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->           PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  1    0.78  0.21   0.008
  1-  8    1.26  0.43   0.014                                              1.23   1.35  1.54  0.045             20.7
  8-  18   1.03  0.39   0.009                                                     1.31  1.63  0.076             27.9
  18- 33   1.00  0.33   0.013                                                     1.37  1.67  0.068             25.9
  33- 43   0.40  0.31   0.019                                                     1.70  1.92  0.041             15.7
  43- 61   0.24  0.20   0.018                                                     1.89  1.98  0.016             9.0
  61- 79   0.05  0.14   0.022
  79- 122  0.03  0.14   0.018                                                     1.80  1.83  0.006             8.5
  122-160  0.07  0.14   0.012
  160-190  0.01  0.14   0.015
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        AVERAGES,   DEPTH   8- 43:  PCT CLAY    0  PCT  .1-75MM     0
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*** PRIMARY CHARACTERIZATION DATA ***

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S85AZ-003-077
SAMPLED AS    : FORREST               ; FINE, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 824, SAMPLE 86P4969-4974

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
            CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                            PASTE
 (CM)       6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                          8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0-  1     6.00 2.16  0.07 0.89                          37.5        1140 4.47 1.16 0.33 0.37 0.056 0.18 0.616   0.52 0.25 2.81 7.95
  1-  8     8.16 4.83  0.14 1.49                          50.7         600 2.21 0.73 0.51 0.22 0.005 0.20 0.616   0.63 0.31 1.17 7.75
  8- 18     11.1 5.87  0.19 1.37                          52.2         890 3.49 1.01 0.58 0.26 0.003 0.20 1.074   0.72 0.36 2.14 7.59
 18- 33     11.8 6.60  0.26 1.62                          54.4         852 3.01 0.91 0.62 0.29 0.003 0.19 0.931   0.78 0.36 1.84 7.57
 33- 43     11.1 5.86  0.23 1.60                          66.3         905 3.17 0.94 0.63 0.29 0.003 0.15 0.410   1.04 0.36 1.58 7.66
 43- 61     15.4 5.98  0.25 1.44                          60.6         970 3.22 0.96 0.66 0.35 0.014 0.13 0.884   1.40 0.30 1.72 7.65
 61- 79     27.8 3.87  0.17 1.04                          49.2         978 3.31 0.98 0.60 0.46 0.013 0.30 0.789   1.73 0.39 1.40 7.53
 79- 122    27.5 3.70  0.24 1.02                          47.4         838 2.62 0.84 0.94 0.40 0.007 0.18 0.442   1.66 0.21 1.06 7.70
 122-160    30.3 3.24  1.06 1.71                          44.6        1040 2.00 0.54 3.58 0.35 0.006 0.18 0.253   1.85 0.22 1.44 7.78
 160-190    27.7 2.41  0.86 0.87                          41.7        1910 2.75 0.69 6.93 0.29 0.005 0.17 0.221   2.07 0.26 1.18 7.72
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NARRATIVE PEDON DESCRIPTION

Pedon: Forrest NSSL Pedon Number: 86P0824
Soil Survey Number S85-AZ-003-077
Location: Cochise County, Arizona
1000' N of R.G. 82; 2310' N and 935' W of SE corner of Sec. 36, T.19S., R.23E. Approximate
Latitude: 31-44-09.02-N Longitude: 109-56-41.72-W
Physiography: terracettes in
Slope: 8% convex north facing Elevation: 1518 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0 Permeability: Slow
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Fine, mixed, superactive, thermic Ustic Calciargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman Sample Date: 24 Oct 1985
95% of surface covered by rock fragments, mostly pebbles.

A1 -- 0 to 1 cm; dry fine sandy loam; dark brown (7.5YR 3/4) moist; weak coarse platy structure; slightly hard, very friable, nonsticky, nonplastic; few medium roots; mildly alkaline (pH=7.4); abrupt smooth boundary.

A2 -- 1 to 8 cm; dry; dark reddish brown (5YR 3/3) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots; mildly alkaline (pH=7.6); abrupt smooth boundary.

Bt1 -- 8 to 18 cm; dry clay; dark reddish brown (5YR 3/4) moist; moderate fine angular blocky structure; hard, firm, sticky, plastic; few medium roots; mildly alkaline (pH=7.6); clear wavy boundary. Thick patchy clay films on faces of peds.

Bt2 -- 18 to 33 cm; dry clay; dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, very firm, sticky, plastic; few medium roots; moderately alkaline (pH=7.8); clear wavy boundary. Thin patchy clay films on faces of peds.

2Btk -- 33 to 43 cm; dry very gravelly clay; reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; hard, very firm, sticky, plastic; few medium roots; strongly effervescent; moderately alkaline (pH=7.8); abrupt wavy boundary. Thin patchy clay films and a few fine loamy masses.

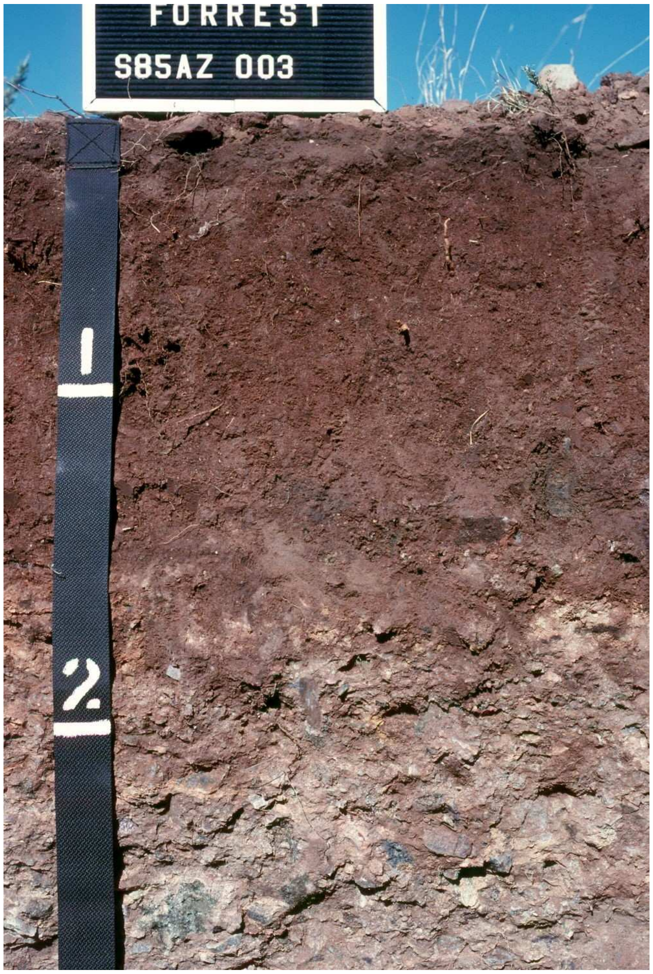
2Bk1 -- 43 to 61 cm; dry very gravelly sandy loam; 90% reddish brown (5YR 5/4) and 10% dark reddish brown (5YR 3/4) moist; hard, very firm, slightly sticky, slightly plastic; few fine roots; strongly effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Common medium lime masses and some 1.5 to 3 cm thick lime lenses.

2Bk2 -- 61 to 79 cm; dry very gravelly sandy loam; pinkish gray (7.5YR 6/2) moist; very hard, friable, nonsticky, nonplastic; few fine roots; strongly effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Common medium lime masses and some 1.5 to 3 cm thick lime lenses.

3Ck1 -- 79 to 122 cm; dry extremely gravelly loamy coarse sand; pinkish gray (7.5YR 6/2) moist; very hard, very friable, weakly cemented, nonsticky, nonplastic; strongly effervescent; strongly alkaline (pH=8.4); clear wavy boundary.

3Ck2 --122 to 163 cm; dry fine sand; pinkish gray (7.5YR 6/2) moist; very hard, very friable, nonsticky, nonplastic; strongly effervescent; strongly alkaline (pH=8.4); clear wavy boundary.

3C --163 to 191 cm; dry sand; pinkish gray (7.5YR 6/2) moist; hard, very friable, nonsticky, nonplastic; strongly effervescent; strongly alkaline (pH=8.4).


FORREST
S85AZ 003
1
2


1
2
3
4
5

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-078 (Pedon 78)                          (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : COMBATE              ; COARSE-LOAMY, MIXED, SUPERACTIVE NONACID, THERMIC USTIC TORRIFLUVENT
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 825, SAMPLES 86P4975-4979                                                       SOIL CONSERVATION SERVICE
Location:
Latitude: 31-43-54.33-N                                                     Longitude: 110-01-25.92-W
Elevation: 1390 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC    - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5    -20   -75     75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A1          9.5   16.0  74.5                           8.9  24.9   18.9 12.9  8.9   5.6  4.1    0.0   0.0   10
86P4975S 5-  18   A2          10.1  16.0  73.9                           10.2 17.2   16.2 15.2  15.2  9.9  6.3    0.0   0.0   16
86P4976S 18- 43   BW1         13.5  16.8  69.9                           8.0  18.0   15.0 14.0  15.0  17.6 8.7    0.0   0.0   26
86P4977S 43- 66   BW2         14.8  18.1  67.1                           8.6  15.6   14.6 13.6  14.6  18.7 11.2   0.0   0.0   30
86P4978S 66-124   BW3         10.8  15.5  71.7                           9.0  16.0   16.0 15.0  16.0  19.2 14.4   1.0   0.0   35
         124-173  C1          8.8   13.5  77.7                           7.8  13.8   17.8 18.8  19.8  22.1 15.7   0.0   0.0   38
86P4979S 173-230  C2          12.1  25.5  62.4                           7.7  13.7   13.7 11.7  15.7  17.5 5.6    0.0   0.0   23
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                               FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
  (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    0.18  0.14  0.006                                                 1.62
  5-  18   0.21  0.22  0.006                                                         1.73 1.74  0.002               6.3
  18- 43   0.23  0.16  0.005                                                         1.79 1.79                      6.0
  43- 66   0.14  0.16  0.005                                                         1.77 1.82  0.009               7.5
  66- 124  0.07  0.18  0.008                                                         1.65 1.67  0.004               9.3
  124-173  0.01  0.21  0.008
  173-226  0.04  0.17  0.010                                                         1.78 1.79  0.002               7.9
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                                   ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-078
SAMPLED AS    : COMBATE              ; COARSE-LOAMY, MIXED, SUPERACTIVE NONACID, THERMIC USTIC TORRIFLUVENT
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 825, SAMPLE 86P4975-4979

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA      K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA     MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                            PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                          8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0-  5      1.28  0.20  0.01  0.70                         22.0          840  2.60  0.66  0.29  0.54  0.53   0.28  0.789  0.91  0.21  0.56  7.62
  5-  18     1.84  5.00  0.05  0.73                         25.3          377  1.16  0.38  0.19  0.27  0.06   0.16  1.405  0.31  0.31  0.48  7.73
  18- 43     1.92  1.13  0.03  0.56                         28.6          700  2.66  0.90  0.34  0.14  0.02   0.14  1.042  0.34  0.30  1.67  7.96
  43- 66     2.64  1.63  0.04  0.92                         28.8          537  1.81  0.68  0.35  0.18  0.01   0.13  0.632  0.23  0.25  1.18  7.42
  66- 124    3.68  1.95  0.11  1.01                         30.5          723  2.10  0.73  0.80  0.24  0.01   0.21  1.326  0.67  0.21  1.43  7.91
  124-173    4.88  1.32  0.22  0.81                         37.5          976  2.38  0.80  1.60  0.25  0.01   0.30  1.500  1.88  0.35  1.23  7.49
  173-226    6.32  1.09  0.88  0.49                         22.8         1620  1.94  0.66  3.37  0.11  0.01   0.29  1.784  2.12  0.80  1.11  7.45
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COMBATE SERIES TYPIC

The Combate series consists of very deep, well drained soils formed in fan alluvium from granite. Combate soils are on alluvial fans and have slopes of 0 to 10 percent. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 65 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, nonacid, thermic Ustic Torrifluvents

TYPICAL PEDON: Combate gravelly loamy coarse sand - rangeland. (Colors are for dry soil unless otherwise noted.)

A1--0 to 1 inch; brown (10YR 5/3) gravelly loamy coarse sand, dark brown (10YR 3/3) moist; weak very fine and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; 30 percent gravel; noneffervescent; neutral (pH 6.6); clear smooth boundary.

A2--1 to 15 inches; dark grayish brown (10YR 4/2) gravelly loamy coarse sand, 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 and few medium roots; 25 percent gravel; noneffervescent; neutral (pH 6.8); gradual wavy boundary. (Combined thickness of the A horizons is 5 to 20 inches)

C1--15 to 29 inches; brown (10YR 4/3) gravelly coarse sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; 30 percent gravel; noneffervescent; slightly acid (pH 6.5); gradual wavy boundary. (10 to 20 inches thick)

C2--29 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sandy loam, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; 35 percent gravel; noneffervescent; neutral (pH 6.9).

TYPE LOCATION: Pima County, Arizona. Latitude of 31 degrees, 57 minutes, 40 seconds North and a longitude of 111 degrees, 33 minutes, 34 seconds West; about 1700 feet West and 1800 feet South of the Northwest corner of Section 8, T. 17 S., R. 8 E.

RANGE IN CHARACTERISTICS:

Soil moisture: Intermittently moist in some part of the soil moisture control section during July - September and December - February. Driest during May and June. The epipedon is moist in some part less than 90 days (cumulative) when the soil temperature is above 41 degrees F. in 7 out of 10 years. Ustic aridic soil moisture regime.

Soil Temperature: 62 to 70 degrees F.

Rock fragments: averages less than 35 percent gravel

Calcium carbonate equivalent: 0 to 3 percent below 20 inches

Organic matter: 1 to 3 percent in the surface and more than .35 percent at a depth of 50 inches

A horizon
Hue: 10YR, 7.5YR
Value: 3 through 5 dry, 2 through 4 moist
Chroma: 2 through 4, dry or moist
Reaction: slightly acid or neutral

C horizons
Hue: 10YR, 7.5YR
Value: 3 through 5 dry, 2 through 4 moist
Chroma: 2 through 6, dry or moist
Reaction: slightly acid to moderately alkaline
Texture: sandy loam, coarse sandy loam, loamy sand, loamy fine sand (less than 18 percent clay)

Some pedons have a buried paleosol in the lower substratum.

COMPETING SERIES: There are no competing series.

GEOGRAPHIC SETTING: Combate soils are on alluvial fans. Slopes range from 0 to 10 percent, but are dominantly 1 to 5 percent. These soils formed in fan alluvium derived from gneiss and granite. Elevation ranges from 2,500 to 5,000 feet. The mean annual precipitation is 12 to 16 inches. The mean annual air temperature is 60 to 68 degrees F. The frost-free period is about 180 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Baboquivari, Romero, Oracle and Comoro soils. Baboquivari and Oracle soils have argillic horizons. Romero and Oracle soils are shallow to a paralithic contact. Comoro soils are calcareous and occur in bottom positions.

DRAINAGE AND PERMEABILITY: Well drained; slow runoff; moderately rapid permeability. Subject to rare sheet flooding in some areas.

USE AND VEGETATION: Used for livestock grazing and wildlife habitat. Vegetation includes Arizona cottontop, spike dropseed, sideoats grama, mesquite, Santa Rita three-awn, shrubby buckwheat and Rothrock grama.

DISTRIBUTION AND EXTENT: Southern Arizona. This series is of moderate extent. This soil occurs in LRR-D, MRLA 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Pima County, Arizona; Soil survey of Tohono O'odham Nation, AZ, Parts of Maricopa, Pima and Pinal Counties; 1993.

REMARKS: Formerly part of the Comoro series. The original Comoro concept allowed for soils that were either calcareous or noncalcareous which crossed reaction classes. The presence or absence of carbonates in these soils was found to be associated with landform and position and easily separated.

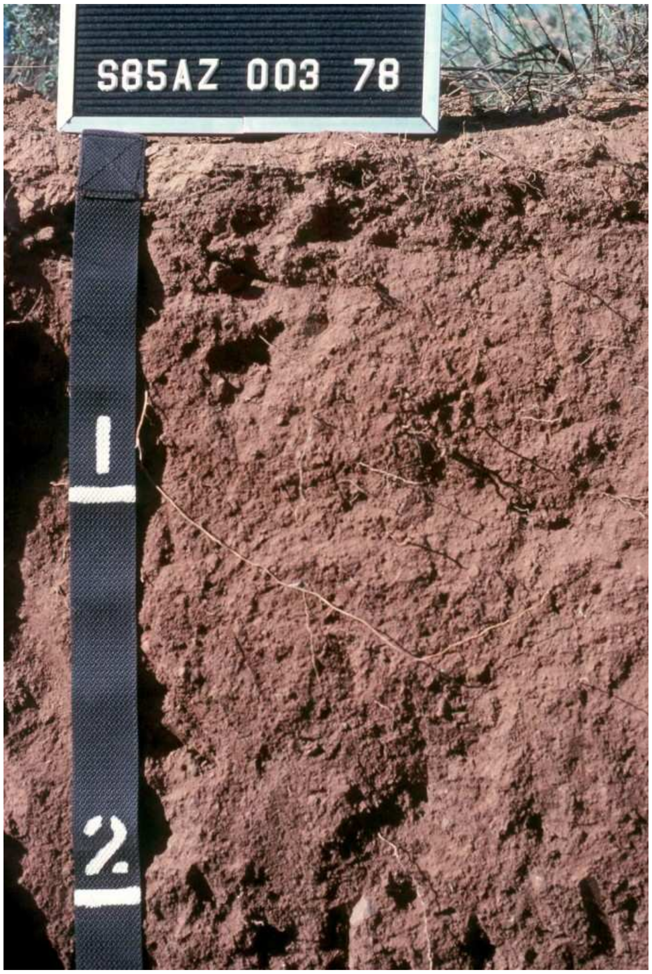
Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 15 inches (A1, A2 horizons)

Entisol feature - The absence of diagnostic subsurface horizons

Classified according to Soil Taxonomy Second Edition, 1999; Keys to Soil Taxonomy Tenth Edition 2006

National Cooperative Soil Survey
U.S.A.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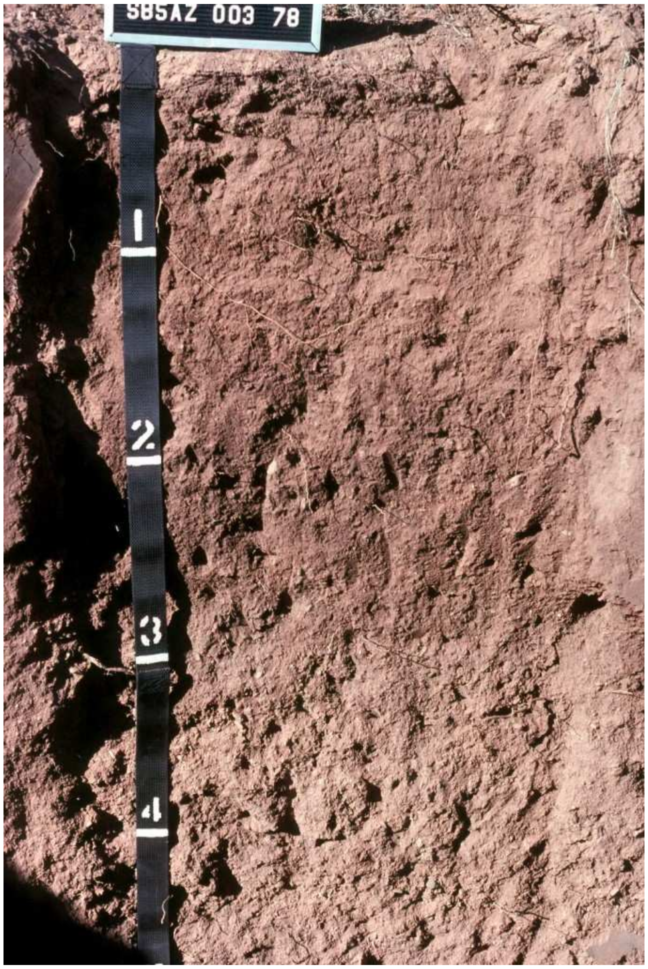
S85AZ 003 78
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-079 (Pedon 79)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : TOMBSTONE            ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                              U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P                                                    SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-18.63-N                                                  Longitude: 109-59-28.51-W
Elevation: 1455 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                             NATIONAL SOIL SURVEY LABORATORY
                                                                                                  LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  2    A1          14.8  20.1  65.1                                  12.2  21.2  17.2  7.2   7.2   4.1   29.9  23.3  0.0   57
         2-  8    A2          21.5  19.5  59.1                                  8.8   19.8  13.8  7.8   8.8   17.5  9.0   21.9  0.0   48
         8-  18   A3          20.8  23.5  55.7                                  7.4   16.4  12.4  8.4   11.4  12.4  18.4  19.1  0.0   51
         18- 46   BK1         22.1  22.8  55.1                                  6.6   12.6  12.6  9.6   13.6  16.4  22.3  13.9  0.0   53
         46- 81   2BK2        8.8   23.5  67.7                                  9.0   17.0  12.0  12.0  12.0  12.2  24.9  15.8  1.0   53
         81- 135  2BK3        10.1  21.5  68.4                                  6.9   18.9  15.9  11.9  14.9  16.0  25.7  16.7  1.0   59
         135-180  3CK1        6.1   17.5  76.4                                  9.3   24.3  15.3  11.3  16.3  15.2  23.4  28.8  1.0   68
         180-225  3CK2        7.5   17.5  75.1                                  8.4   21.4  18.4  12.4  14.4  14.9  27.6  27.0  1.0   70
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
         <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
 0-  2     0.63 0.31  0.016
 2-  8     1.18 0.50  0.020                                                    1.22
 8-  18    1.58 0.47  0.019
 18- 46    0.53 0.28  0.015
 46- 81    0.18 0.22  0.014
 81- 135   0.10 0.21  0.010
 135-180   0.22 0.15  0.014
 180-225   0.08 0.18  0.011
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-079
SAMPLED AS    : TOMBSTONE            ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 825, SAMPLE 86P4975-4979

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES   EC   CA    MG    NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                           PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                        8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0-  2     30.2 0.65  0.05 1.03                         34.3         990  5.44  0.56  0.16  0.32  0.017  0.24  0.789   0.93  0.39  2.20  7.53
  2-  8     33.6 0.88  0.01 1.05                         44.2         703  3.95  0.40  0.19  0.17  0.065  0.16  0.363   0.43  0.29  1.50  7.74
  8-  18    35.7 0.74  0.18 0.67                         49.2         770  4.21  0.41  0.18  0.10  0.009  0.20  0.616   0.70  0.30  1.70  7.47
  18- 46    32.4 0.33  0.06 0.33                         35.4         760  4.01  0.41  0.28  0.06  0.030  0.25  0.300   1.19  0.26  1.35  7.57
  46- 81    30.4 0.80  0.14 0.30                         30.5         850  4.11  0.58  0.48  0.06  0.022  0.32  1.089   1.62  0.30  1.06  7.79
  81- 135   25.9 1.94  0.33 0.29                         23.5        1480  5.01  1.07  1.39  0.06  0.014  0.31  1.089   2.19  0.56  1.00  7.42
  135-180   33.7 3.62  0.99 0.33                         33.8         882  3.76  1.00  6.83  0.05  0.014  0.73  0.568   2.13  2.10  1.16  7.41
  180-225   27.0 2.41  0.67 0.31                         24.6        1198  3.15  0.63  5.41  0.06  0.011  0.13  0.758   0.72  3.20  1.10  7.46
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TOMBSTONE SERIES TYPIC

The Tombstone series consists of very deep, somewhat excessively drained soils that formed in fan alluvium. Tombstone soils are on fan and stream terraces and have slopes of 1 to 50 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 63 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, thermic Ustic Haplocalcids

TYPICAL PEDON: Tombstone very gravelly fine sandy loam - rangeland. (Colors are for dry soil unless otherwise noted.) Surface rocks - 50 to 65 percent of the surface is covered with gravel and cobbles

A--0 to 1 inch; grayish brown (10YR 5/2) very gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; 52 percent gravel; strongly effervescent, 13 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk1--1 to 5 inches; dark grayish brown (10YR 4/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 21 percent gravel; violently effervescent, 17 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); abrupt smooth boundary.

Bk2--5 to 13 inches; pinkish white (7.5YR 8/2) gravelly sandy loam, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common very fine and fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 21 percent gravel; violently effervescent, 22 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary.

Bk3--13 to 27 inches; pinkish gray (7.5YR 7/2) very gravelly sandy loam, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; few very fine and fine tubular pores; many distinct calcium carbonate coatings on rock fragments; 47 percent gravel; violently effervescent, 19 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); gradual smooth boundary.

Bk4--27 to 60 inches; pinkish gray (7.5YR 6/2) very gravelly loamy sand, brown (7.5YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine and fine irregular and tubular pores; few prominent calcium carbonate coatings on rock fragments; 38 percent gravel; strongly effervescent, 6 percent calcium carbonate equivalent; moderately alkaline (pH 8.0).

TYPE LOCATION: Cochise County, Arizona; located at a latitude of 32 degrees, 44 minutes, 13 seconds North and a longitude of 109 degrees, 59 minutes, 50 seconds West; about 1,310 feet west and 2,275 feet north of the southeast corner of section 33, Township 19 S., Range 23 E.

RANGE IN CHARACTERISTICS:

Soil Moisture: Intermittently moist in some part of the soil moisture control section during July-September and December-February. Driest during May and June. The epipedon is moist in some part less than 90 days (cumulative) when the soil temperature is above 41 degrees F. in 7 out of 10 years. Ustic aridic soil moisture regime.

Rock Fragments: Averages 35 to 70 percent in the particle-size control section, but ranges from 15 to 90 percent in any one horizon

Soil Temperature: 59 to 70 degrees F.

Depth to calcic horizon: 1 to 20 inches. Is weakly cemented in some pedons

Calcium carbonate equivalent: Averages 20 to 35 percent, but ranges from 5 to 40 percent in any one horizon

A horizon
Hue: 7.5YR, 10YR
Value: 4 through 7 dry, 2 through 5 moist
Chroma: 2 through 4, dry or moist

Bk horizon
Hue: 7.5YR, 10YR

Value: 3 through 8, dry or moist
Chroma: 2, 3 or 4 dry, 1 through 4 moist
Texture: Sandy loam, loam, coarse sandy loam, fine sandy loam (5 to 18 percent clay); can range to include loamy sand and loamy coarse sand below 30 inches.

COMPETING SERIES: These are the Chilicotal (TX), Gallen (NM), Gilland (NM), Polar (TX), and Powerline (AZ) series. Chilicotal soils have 15 to 27 percent clay in the control section. Gallen soils have gypsum accumulations. Polar soils have mean annual precipitation of 16 to 24 inches. Gilland soils are moderately deep to shale and sandstone. In addition, Gallen soils are in the Pecos-Canadian Plains and Valleys (MLRA 70); Polar soils are in the Central Rolling Red Plains (MLRA 78); both soils are moist in May and June. Powerline soils have bedrock at depths of 20 to 40 inches.

GEOGRAPHIC SETTING: Tombstone soils are in the Sonoran and Chihuahuan deserts on fan terraces and stream terraces and have slopes of 1 to 50 percent. These soils formed in fan alluvium from mixed sources. Elevations range from 3,000 to 5,300 feet. The mean annual precipitation is 12 to 16 inches. The mean annual air temperature is 57 to 68 degrees F. The frost-free period is 160 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Elgin, Pedregosa and Stronghold soils. Elgin soils have argillic horizons. Pedregosa soils are very shallow and shallow to a petrocalcic horizon. Stronghold soils are coarse-loamy.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained; slow runoff; moderately rapid permeability.

USE AND VEGETATION: Tombstone soils are used for livestock grazing and wildlife habitat. Some areas are used for watershed research. The present vegetation is threeawn, black grama, sideoats grama, tarbush, whitethorn, and creosotebush.

DISTRIBUTION AND EXTENT: Central Arizona portion of the Upper Sonoran desert and Southeastern Arizona portion of the Chihuahuan desert. This series is not extensive. MLRA is 38 and 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Pima County, Arizona; Soil survey of Pima County, Arizona, Eastern Part; 1986.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

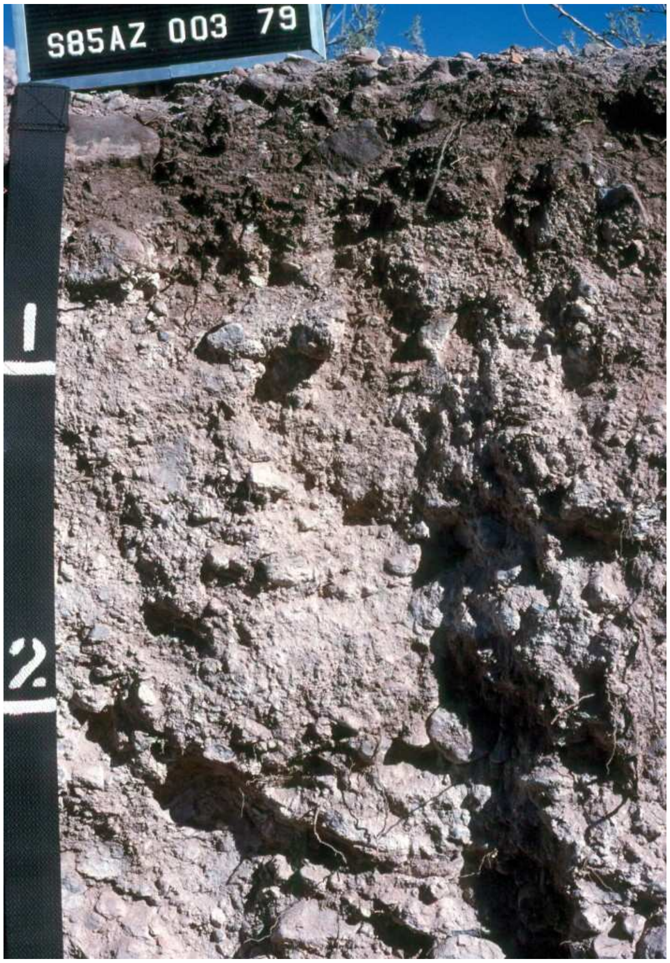
Ochric epipedon - The zone from 0 to 1 inch (A horizon)

Calcic horizon - The zone from 1 to 60 inches (Bk1, Bk2, Bk3, Bk4 horizons)

Classified according to Soil Taxonomy Second Edition, 1999; Keys to Soil Taxonomy Tenth Edition, 2006.

The type location was moved to the Douglas-Tombstone Area in April 2000.

National Cooperative Soil Survey
U.S.A.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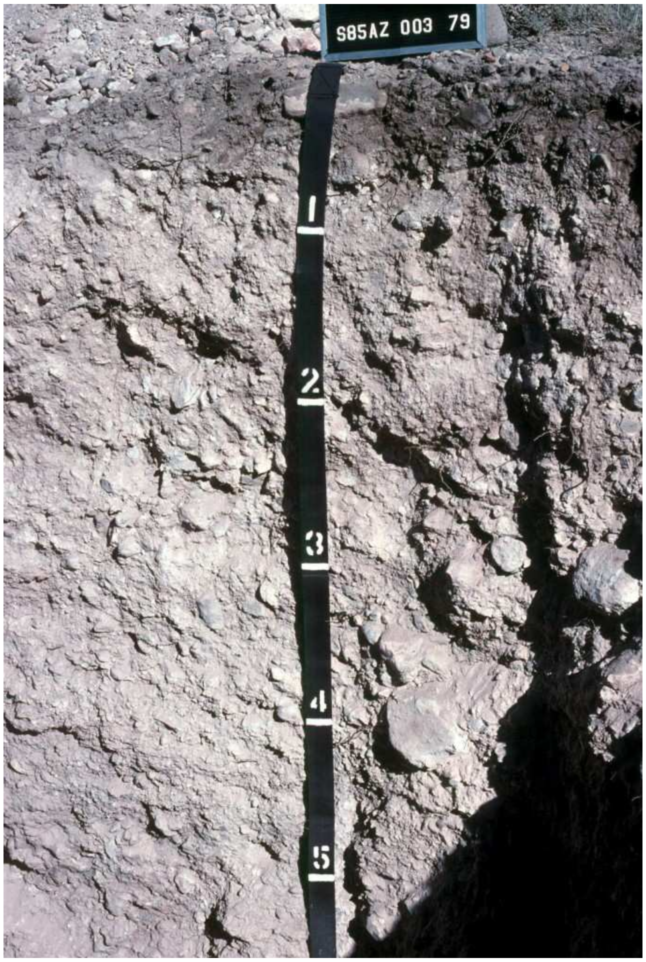
S85AZ 003 79
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                                     ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-080 (Pedon 80)                                (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : CHIRICAHUA           ; CLAYEY, MIXED, SUPERACTIVE, THERMIC SHALLOW USTIC HAPLARGID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                              U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 826, SAMPLES 86P4980-4980                                                      SOIL CONSERVATION SERVICE
Location:
Latitude: 31-41-49.09-N                                                     Longitude: 110-02-45.63-W
Elevation: 1415 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                             NATIONAL SOIL SURVEY LABORATORY
                                                                                                  LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2    5     20     .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
86P4980S 0-  5     A          17.5 19.5  63.1                           12.6  28.6   10.6 5.6   5.6   3.78  11.2  44.4   10.0 60
         5- 18     BT1        28.8 16.8  54.4                           12.5  17.5   12.8 6.5   5.5   4.63  16.9  35.7   0.0  58
         18-33     BT2        20.8 12.8  66.4                           7.3   14.3   30.3 11.3  3.3   2.13  1.62  0.0    0.0  4
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
              C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
  (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 5     0.77 0.29  0.008                                                  1.23   1.49  1.62  0.028             16.3
  5- 18    1.06 0.34  0.008
  18-33    0.74 0.26  0.004
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                                  ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-080
SAMPLED AS    : CHIRICAHUA           ; CLAYEY, MIXED, SUPERACTIVE, THERMIC SHALLOW USTIC HAPLARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 826, SAMPLE 86P4980-4980

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG    NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES               CATS   OAC  + AL   8A3A                                                       PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                    8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L--------><UEQ/L> <----MEQ/L----->
  0- 5       3.84  1.13  0.02  1.36                           27.4         370  2.02  0.57  0.23  0.37  0.163  0.20  1.089   0.44  0.26  0.79  7.37
  5- 18      6.00  2.49  0.05  1.86                           43.9         642  2.35  0.65  0.25  0.23  0.123  0.35  0.850   0.46  0.66  1.01  7.24
  18-33      2.16  2.03  0.06  0.20                           30.5         703  2.56  0.77  0.25  0.10  0.080  0.17  1.042   0.69  0.31  1.26  7.24
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NARRATIVE PEDON DESCRIPTION

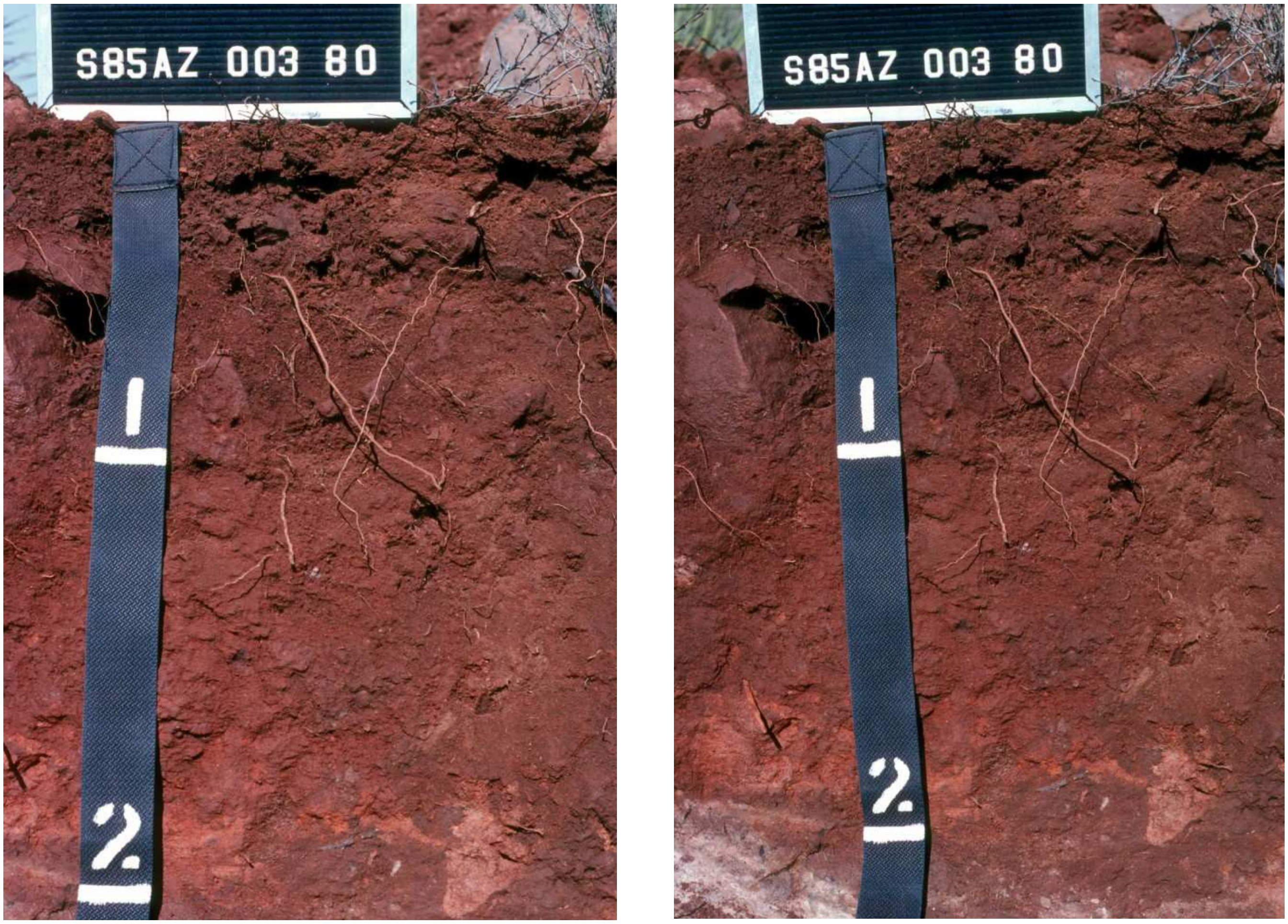
Pedon: Chiricahua NSSL Pedon Number: 86P0826
Soil Survey Number S85-AZ-003-080
Location: Cochise County, Arizona
1460' S and 550' W of the NE corner of Sec. 13, T.20S., R.22E. Approximate.
Latitude: 31-41-49.09-N Longitude: 110-02-45.63-W
Slope: 9% convex northeast facing Elevation: 1415 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0 Permeability: Moderately slow
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material: alluvium from mixed material
Classification: Clayey, mixed, superactive, thermic shallow Ustic Haplargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman Sample Date: 10/85
60% of surface covered by rock fragments, 50% cobbles and 50% pebbles.

A -- 0 to 5 cm; dry cobbly sandy loam; dark reddish brown (5YR 3/4) moist; moderate very fine subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few medium roots; few medium vesicular pores; mildly alkaline (pH=7.3); abrupt wavy boundary.

Bt1 -- 5 to 15 cm; dry very gravelly sandy clay loam; dark reddish brown (2.5YR 3/4) moist; moderate fine subangular blocky structure; hard, firm, sticky, plastic; few medium roots; few medium tubular pores; mildly alkaline (pH=7.7); abrupt wavy boundary. Thin discontinuous clay films on faces of peds. 40 to 60% rock fragments; about 30% of which are cobbles.

Bt2 -- 15 to 33 cm; dry very gravelly sandy clay loam; dark red (2.5YR 3/6) moist; moderate fine subangular blocky structure; hard, firm, sticky, plastic; few medium roots; few fine tubular pores; mildly alkaline (pH=7.7); abrupt wavy boundary. Thin discontinuous clay films on faces of peds. 40 to 60% rock fragments; about 30% of which are cobbles.

2R -- 33 to 33 cm; dry. Rhyolite.


S85AZ 003 80
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S85AZ 003 80
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-081 (Pedon 81)                         (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : McNEAL              ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                          U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 827, SAMPLES 86P4981-4985                                                  SOIL CONSERVATION SERVICE
Location:
Latitude: 31-42-54.47-N                                                    Longitude: 110-01-49.56-W
Elevation: 1383 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                         NATIONAL SOIL SURVEY LABORATORY
                                                                                              LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT  .002  .05     LT    LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A           14.1  21.5  64.4                                 9.5   15.5  13.5  12.5  13.5  21.6  8.8    0.0   0.0   30
86P4981S  5-  18   BW1         24.8  22.1  53.1                                 8.2   10.2  9.2   11.2  14.2  15.7  15.7   10.0  0.0   42
86P4982S 18- 30   BW2         31.5  21.5  47.0                                 6.2   6.2   7.2   9.2   18.2  19.9  13.2   5.56  1.00  39
86P4983S 30- 58   2BK1        22.8  19.5  57.7                                 6.4   8.4   11.4  13.4  18.4  23.9  18.2   0.0   0.0   42
86P4984S 58- 91   2BK2        20.8  20.8  58.4                                 6.1   11.1  12.1  14.1  15.1  23.5  20.0   1.00  0.0   45
86P4985S 91- 130  3BK3        15.5  10.4  74.1                                 11.2  19.2  19.2  18.2  18.2  22.7  25.3   6.38  0.0   54
         130-190  3C          5.5   9.7   84.8                                 3.6   8.6   21.6  24.6  26.6  22.9  30.2   9.8   1.00  63
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI  MOIST  BAR   DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
 0-  5     0.74  0.27  0.020                                                1.17
 5-  18    1.26  0.41  0.030                                                      1.51  1.55  0.009             13.2
 18- 30    1.04  0.27  0.018                                                      1.39  1.46  0.017             16.1
 30- 58    0.41  0.23  0.019                                                      1.47  1.47                    15.9
 58- 91    0.19  0.24  0.035                                                      1.60  1.67  0.014             11.0
 91- 130   0.15  0.20  0.018                                                      1.73  1.79  0.011             8.0
 130-190   0.16  0.19  0.013
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                        ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-081
SAMPLED AS    : McNEAL               ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 827, SAMPLE 86P4981-4985

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-
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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                          PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                        8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L--------->  <UEQ/L> <----MEQ/L----->
  0-  5     27.8 1.38  0.05 2.32                          32.5          976  4.06  0.62  0.26  0.45  0.215  0.30  1.326   0.77  0.71  1.44  7.45
  5-  18    33.4 1.32  0.0  1.32                          52.3          676  7.45  0.47  0.19  0.15  0.067  0.15  0.584   0.42  0.29  1.57  7.52
  18- 30    34.6 1.67  0.01 0.59                          47.9          975  4.43  0.58  0.32  0.06  0.090  0.21  1.342   1.04  0.44  1.31  7.30
  30- 58    30.2 2.99  0.04 0.40                          43.3          742  3.68  0.70  0.39  0.10  0.056  0.21  2.226   1.02  0.39  1.23  7.45
  58- 91    32.4 5.83  0.28 0.55                          40.6          892  2.48  0.86  1.61  0.07  0.015  0.23  1.895   1.86  0.29  1.03  7.88
  91- 130   24.3 4.57  0.73 0.55                          32.1         2820  5.01  1.31  8.36  0.15  0.030  0.18  2.289   6.68  3.98  0.96  7.54
  130-190   13.3 4.53  0.96 0.99                          29.9         3880  4.52  3.53  11.7  0.38  0.074  0.23  0.726   4.51  13.6  0.83  7.47
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NARRATIVE PEDON DESCRIPTION

Pedon: McNeal   NSSL Pedon Number: 86P0827
Soil Survey Number S85-AZ-003-081
Location: Cochise County, Arizona
1250' W and 350' S of the NE corner of Sec. 7, T.20S., R.23E. Approximate.
Latitude: 31-42-54.47-N   Longitude: 110-01-49.56-W
Physiography: terracettes in
Slope: 3% convex south facing   Elevation: 1383 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0   Permeability: Moderately rapid
Drainage: Somewhat excessively drained   Land Use:
Stoniness: Erosion or Deposition: Slight   Runoff:
Parent Material:
Classification: Fine-loamy, mixed, superactive, thermic Ustic Calciargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. Wiliam Emmerich, Dr. Grossman   Sample Date: 10/85

85% surface covered by rock fragments, mostly pebbles. Observed an actual runoff event. Slope length 110'. after .65 of ppt had fallen in the previous 8 hrs. Runoff occured and continued for at least 20 min. but not more than 30.

A -- 0 to 5 cm; pink (7.5YR 7/4) dry very gravelly sandy loam; brown to dark brown (7.5YR 4/4) moist; weak coarse platy structure; slightly hard, very friable, nonsticky, nonplastic; few medium roots; few medium vesicular pores; strongly effervescent; moderately alkaline (pH=8.2); abrupt wavy boundary.

Bw1 -- 5 to 18 cm; light brown (7.5YR 6/4) dry gravelly sandy loam; brown to dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots; few medium interstitial pores and; strongly effervescent; strongly alkaline (pH=8.4); 34 percent pebbles; clear wavy boundary. Lime as a few fine irregular masses and as coats on undersides of rocks.

Bw2 -- 18 to 30 cm; light brown (7.5YR 6/4) dry extremely gravelly sandy loam; brown (7.5YR 5/4) moist; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine roots; few medium interstitial pores and; strongly effervescent; strongly alkaline (pH=8.4); 67 percent pebbles; abrupt wavy boundary. Lime as a few fine irregular masses and as coats on udersides of rocks.

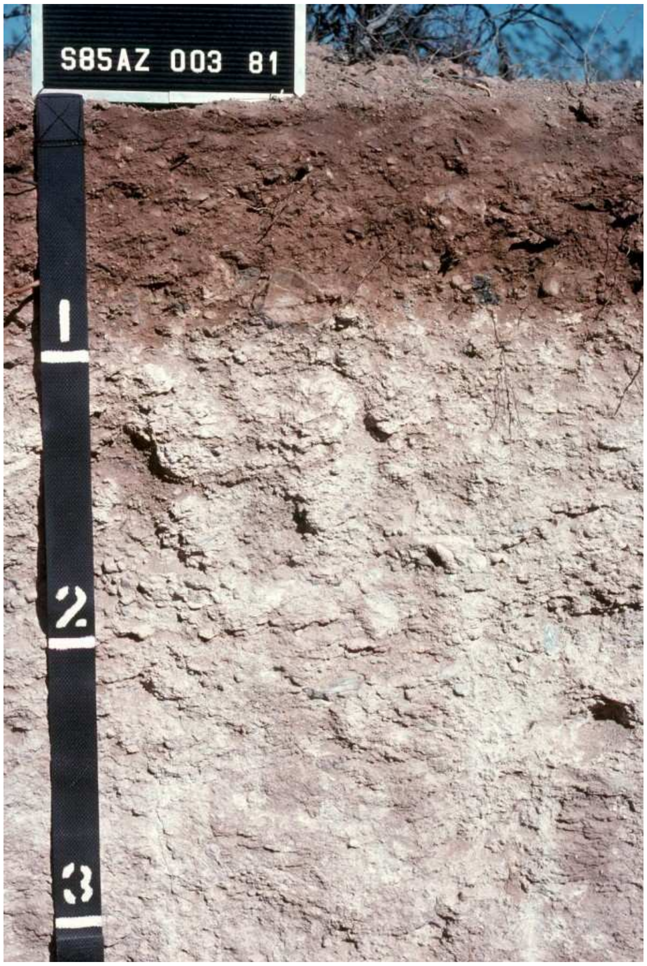
2Bk1 -- 30 to 58 cm; pink (7.5YR 7/4) dry extremely gravelly sandy loam; light brown (7.5YR 6/4) moist; weakly cemented; few very fine roots; few fine interstitial pores and; strongly alkaline (pH=8.4); 70 percent pebbles; abrupt wavy boundary. Lime as many large irregular masse and nodules.

2Bk2 -- 58 to 91 cm; pink (7.5YR 7/4) dry extremely gravelly sandy loam; light brown (7.5YR 6/4) moist; weakly cemented; few very fine roots; few fine interstitial pores and; strongly alkaline (pH=8.4); 34 percent pebbles; abrupt wavy boundary. Lime as many large irregular masses and nodules.

3Bk3 -- 91 to 130 cm; brown (7.5YR 5/4) dry very gravelly loamy coarse sand; brown to dark brown (7.5YR 4/4) moist; weakly cemented; common coarse interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 33 percent pebbles; abrupt wavy boundary.

3C --130 to 191 cm; brown (7.5YR 5/4) dry very gravelly loamy coarse sand; brown to dark brown (7.5YR 4/4) moist; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; common coarse interstitial pores; strongly effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Weakly stratified.

4Btb --191 to 216 cm; reddish brown (5YR 5/4) dry sandy loam; reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; very hard, firm, slightly sticky, slightly plastic; few fine tubular pores and; slightly effervescent; moderately alkaline (pH=8.0); 5 percent pebbles. Thick patchy Mn coats on peds and lining pores; clay films are thin and discontinuous.


S85AZ 003 81
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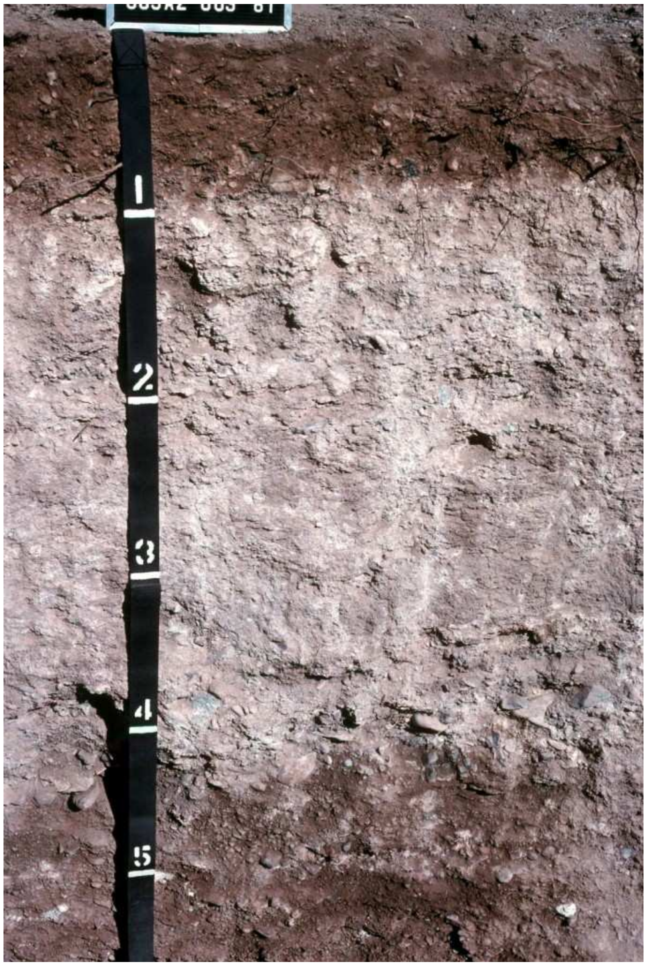
1
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                            ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-082 (Pedon 82)                            (COCHISE COUNTY, ARIZONA)

SAMPLED AS    :  McNEAL             ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 828, SAMPLES 86P4986-4988                                                       SOIL CONSERVATION SERVICE
Location:
Latitude: 31-40-54.45-N                                                     Longitude: 109-59-33.52-W
Elevation: 1438 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON      LT  .002  .05    LT    LT   .002  .02   .05   .10   .25    .5      1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002 .002   -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5     A          15.5  30.4  54.1                           17.8  18.8  8.8   4.8  3.8   4.0   6.5   0.0    0.0  11
86P4986S 5-  23    BW1        31.5  26.4  42.1                           11.4  12.4  8.4   5.4  4.4   5.7   2.6   2.0    0.0  11
86P4987S 23- 48    BW2        32.8  29.1  38.1                           7.8   9.8   7.8   5.8  6.8   16.3  18.8  1.0    0.0  34
         48- 78    2BK1       22.1  35.1  42.8                           5.8   9.8   9.8   8.8  8.8   14.3  12.8  1.0    0.0  28
         78- 100   2BK2       11.5  20.4  68.1                           9.0   13.0  13.0  16.0 17.0  18.3  27.1  1.0    0.0  47
         100-125   BTKB       9.5   29.1  61.5                           8.9   7.9   11.9  14.9 17.9  11.7  11.3  17.1   0.0  41
86P4988S 125-180   3C         6.8   25.7  67.5                           10.7  13.7  15.7  13.7 13.7  13.5  15.6  13.1   0.0  43
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE           15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10  1/3    15  WHOLE
 DEPTH                               FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST   BAR  BAR    BAR  SOIL
  (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    0.66 0.28  0.020                                                   1.38
  5-  23   1.32 0.41  0.025                                                          1.38  1.49 0.026               21.1
  23- 48   1.01 0.37  0.030                                                          1.32  1.40 0.020               26.9
  48- 78   0.46 0.40  0.041
  78- 100  0.37 0.30  0.043
  100-125  0.25 0.29  0.020
  125-180  0.31 0.26  0.012                                                          1.54  1.58 0.009               13.9
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*** PRIMARY CHARACTERIZATION DATA ***

S85AZ-003-082
SAMPLED AS : McNEAL ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
NATIONAL SOIL SURVEY LABORATORY ; PEDON 86P 828, SAMPLE 86P4986-4988

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-		
	(- NH4OAC EXTRACTABLE BASES -)					ACID-	EXTR	(- - - -CEC - - -)			-----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------											PH
DEPTH (CM)	CA 5B4A 6N2E	MG 5B4A 6O2D	NA 5B4A 6P2B	K 5B4A 6Q2B	SUM BASES	ITY 6H5A	AL 6G9A	SUM CATS 5A3A	NH4- OAC 5A2A	BASES + AL 5A3B	EC 8A3A uMHOS /CM	CA 6N1B	MG 6O1B	NA 6P1B	K 6Q1B	NO3-N	NH3	PO4-P	SO4	Cl	HCO3	SAT. PASTE 8C1B
	<- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->											<------------------MEQ/L--------->						<UEQ/L>	<----MEQ/L----->			
0- 5	33.5	1.01	0.31	2.26					36.4		732	3.42	0.47	0.24	.026	0.040	0.26	3.789	.086	0.36	1.42	7.59
5- 23	34.2	1.38	-.-	0.96					28.8		802	4.65	0.45	0.25	0.14	0.012	0.13	1.974	0.84	0.38	1.60	7.48
23- 48	32.6	3.57	-.-	0.48					26.6		2350	12.9	0.90	0.57	0.12	0.004	0.26	1.658	6.62	0.30	1.12	7.36
48- 78	33.4	2.62	0.24	0.53					29.4		4600	23.6	3.54	2.78	0.19	0.005	0.27	1.247	7.19	0.43	0.86	7.32
78- 100	29.1	5.19	0.73	0.56					48.8		4000	15.6	4.02	6.26	0.16	0.008	0.20	0.426	7.23	2.49	0.95	7.64
100-125	27.9	5.48	0.55	0.69					41.0		2350	6.15	1.12	4.57	0.13	0.007	0.26	0.758	6.21	3.91	0.92	7.44
125-180	25.7	7.24	0.81	0.72					44.1		1270	2.56	1.10	2.62	0.14	0.012	0.16	3.394	1.40	3.31	1.30	7.60

NARRATIVE PEDON DESCRIPTION

Pedon: McNeal
NSSL Pedon Number: 86P0828
Soil Survey Number S85-AZ-003-082
Location: Cochise County, Arizona
100' S of R.G. 48; 880' S of the NE corner of Sec. 21, T.20S., R.23E. Approximate.
Latitude: 31-40-54.45-N
Longitude: 109-59-33.52-W
Physiography: terracettes in
Slope: 3% convex south facing
Elevation: 1438 m MSL
Precipitation: cm - Udic Moisture Regime.
Water Table Depth: 0
Permeability: Moderately rapid
Drainage: Somewhat excessively drained
Land Use:
Stoniness:
Erosion or Deposition: Slight
Runoff:
Parent Material:
Classification: Fine-loamy, mixed, superactive, thermic Ustic Calciargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman
Sample Date: 10/85

35% of the surface is covered by rock fragments, mostly pebbles. Rock fragments average 35 to 45% in the particle size control section, some suborders have as much as 65%.

A1 -- 0 to 5 cm; brown to dark brown (10YR 4/3) moist gravelly fine sandy loam; weak coarse platy structure; soft, friable, nonsticky, nonplastic; many very fine vesicular pores; violently effervescent; moderately alkaline (pH=8.2); abrupt wavy boundary.

Bw1 -- 5 to 23 cm; brown to dark brown (10YR 4/3) moist gravelly fine sandy loam; weak fine subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); clear wavy boundary.

Bw2 -- 23 to 48 cm; brown to dark brown (10YR 4/3) moist gravelly loam; weak medium subangular blocky structure; slightly hard, firm, nonsticky, nonplastic; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Few fine irregular lime masses.

2Bk1 -- 48 to 79 cm; light gray (10YR 7/2) moist very gravelly sandy loam; white (10YR 8/2) dry; very hard, extremely firm, nonsticky, nonplastic; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Many large irregular lime masses. Weakly cemented horizon.

2Bk2 -- 79 to 102 cm; 60% very pale brown (10YR 7/3) and 40% brown to dark brown (7.5YR 4/4) moist very gravelly sandy loam; 60% white (10YR 8/2) and 40% light brown (7.5YR 6/4) dry; very hard, extremely firm, nonsticky, nonplastic; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Weakly cemented horizon.

3Btkb --102 to 127 cm; brown to dark brown (7.5YR 4/4) moist very gravelly sandy loam; light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; very hard, extremely firm, sticky, slightly plastic; few fine tubular pores; strongly effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Thin (less than 1/4) shattered laminar cap at top of this horizon. Weakly cemente horizon.

3C --127 to 178 cm; brown to dark brown (7.5YR 4/4) moist gravelly sandy loam; light brown (7.5YR 6/4) dry; hard, friable, nonsticky, nonplastic; few fine interstitial pores; strongly effervescent; strongly alkaline (pH=8.4). Weakly cemented horizon.


S85AZ 003 82
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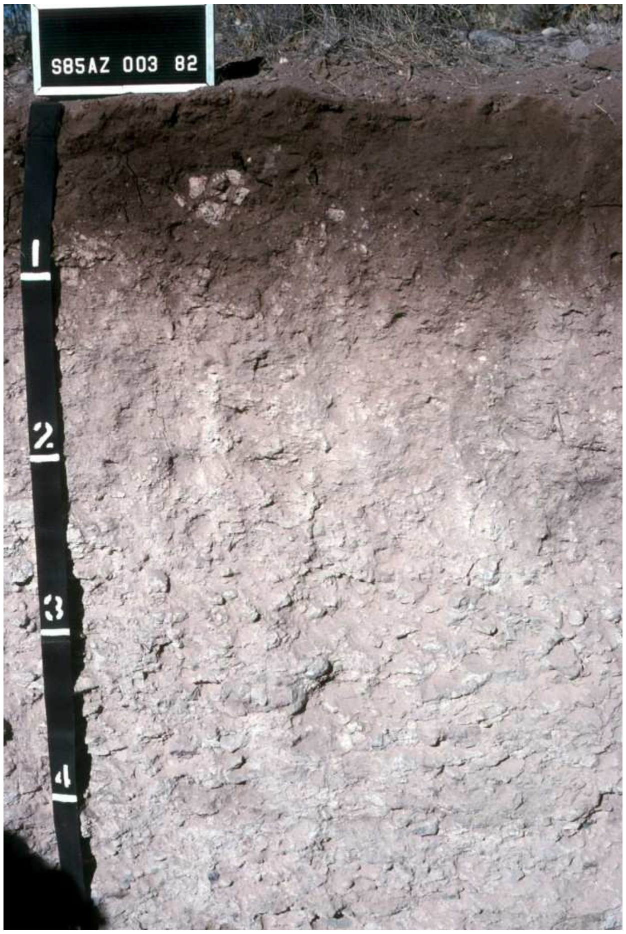
S85AZ 003 82
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                           ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-083 (Pedon 83)                          (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : PEDREGOSA            ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC SHALLOW USTIC PETROCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                  U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P                                                                                    SOIL CONSERVATION SERVICE
Location:
Latitude: 31-40-37.97-N                                                    Longitude: 110-01-21.51-W
Elevation : 1433 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                                 NATIONAL SOIL SURVEY LABORATORY
                                                                                                      LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC    - - - - WEIGHT - - - -    WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT  .002  .02   .05   .10   .25    .5     1     2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20    -75     75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0- 2      A          14.8  35.1  50.1                                14.2  14.2   6.2   6.2   9.2   10.1  23.4   1.0    0.0   35
         2- 18     BW         23.5  33.7  42.8                                 8.6  17.6   4.6   4.6   7.6   7.6   14.7  25.6    0.0   48

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                  FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
 0- 2      1.00  0.51   0.04                                                 1.22
 2- 18     1.69  0.47   0.08

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                         ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-083
SAMPLED AS    : PEDREGOSA            ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC SHALLOW USTIC PETROCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 828

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                          PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                       8C1B
            <- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0- 2       23.1  0.67   -.-   0.79                     36.7        1800  7.86  0.77  0.24  0.30  0.009  0.38  1.452   0.89  0.62  3.28  7.56
  2- 18      30.2  0.86   0.01  0.75                     52.2         820  5.84  0.55  0.24  0.11  0.008  0.22  1.026   0.80  0.32  1.65  7.73

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PEDREGOSA SERIES TYPIC

The Pedregosa series consists of very shallow and shallow to a hardpan, well drained soils that formed in mixed calcareous fan alluvium. Pedregosa soils are on fan terraces. Slope ranges from 3 to 20 percent. The mean annual precipitation is about 14 inches and mean annual air temperature is about 63 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, thermic, shallow Calcic Petrocalcids

TYPICAL PEDON: Pedregosa very gravelly fine sandy loam rangeland (colors are for dry soil unless otherwise noted). 40 to 50 percent of the surface is covered with gravel and cobbles.

A--0 to 1 inch; brown (7.5YR 4/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; weak granular structure; loose, nonsticky and nonplastic; common very fine and fine roots; few fine irregular pores; 52 percent gravel; violently effervescent, 6.5 percent calcium carbonate equivalent; moderately alkaline (pH 8.2); clear smooth boundary (1 to 3 inches thick).

Bk--1 to 7 inches; brown (7.5YR 4/3) very gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, moderately sticky and moderately plastic; common very fine and fine and few medium roots; common fine irregular and tubular pores; many distinct calcium carbonate coatings on rock fragments; 40 percent gravel; violently effervescent, 9 percent calcium carbonate equivalent; moderately alkaline (pH 8.4); abrupt smooth boundary (5 to 15 inches thick).

Bkm--7 to 13 inches; fractured hardpan; extremely hard, strongly cemented by calcium carbonate; violently effervescent; abrupt wavy boundary (5 to 20 inches thick).

2Ck--13 to 60 inches; 70 percent white (7.5YR 8/1) and 30 percent brown (7.5YR 5/4) very gravelly sandy loam, 70 percent pinkish gray (7.5YR 7/2) and 30 percent strong brown (7.5YR 4/6) moist; massive; hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; stratified laminar capping throughout; many distinct calcium carbonate coatings on rock fragments; common fine irregular hard calcium carbonate masses; 54 percent gravel; violently effervescent, 35 percent calcium carbonate equivalent; moderately alkaline (pH 8.0).

TYPE LOCATION: Cochise County, Arizona; located about 2,200 feet west and 1,450 feet south from the northwest corner of section 20, Township 20 S., Range. 23 E.; Tombstone topography map; latitude 31 degrees, 41 minutes, 55 seconds North and longitude 110 degrees, 00 minutes, 57 seconds West.

RANGE IN CHARACTERISTICS:
Soil moisture - Intermittently moist in some part of the soil moisture control section during July - September and December - February. Driest during May and June. Ustic Aridic soil moisture regime.

Soil Temperature: 62 to 69 degrees F.

Rock fragments: 35 to 60 percent gravel and cobbles

Reaction: slightly alkaline to moderately alkaline

Clay content: 5 to 18 percent in the control section

Organic matter: 1 to 2 percent

Calcium carbonate equivalent: 5 to 25 percent

Depth to petrocalcic horizon: 5 to 20 inches

A horizon
Hue: 7.5YR, 10YR
Value: 3 to 5 dry, 2 to 4 moist
Chroma: 2 or 3 dry, 2 to 4 moist
Texture: loam, fine sandy loam, sandy loam

Bk horizon
Hue: 7.5YR, 10YR
Value: 3 to 6 dry, 2 to 5 moist
Chroma: 2 or 3 dry, 2 to 4 moist
Texture: loam, fine sandy loam, sandy loam

2Ck horizon
Hue: 7.5YR, 10YR
Value: 5 to 8 dry, 4 to 7 moist
Chroma: 1 to 4 dry, 2 to 6 moist

Texture: sandy loam, loamy sand
Calcium carbonate content: 15 to 40 percent

COMPETING SERIES: These are the Kimrose (AZ), Delnorte (TX), Missile (NM), Winkel (UT), and Yurm (NV) series. Kimrose soils have 18 to 35 percent clay in the particle-size control section. Missile soils have greater than 60 percent rock fragments in the control section. Delnorte, Winkel, and Yurm are in the Typic Adic soil moisture regime. Winkel and Cheosa have bedrock at 20 to 40 inches.

Missle soils have greater than 60 percent rock fragments in the control section.

Cheosa, Delnorte, Winkel, and Yurm are in the Typic Ardic soil moisture regime.

Winkel and Cheosa have bedrock at 20 to 40 inches.

GEOGRAPHIC SETTING: The Pedregosa soils are in the Chihuahuan desert on fan terraces at elevations of 3,900 to 5,000 feet. Slope ranges from 3 to 20 percent. These soils formed from mixed calcareous fan alluvium. The mean annual precipitation is 12 to 16 inches and occurs as thunderstorms during July to September and as gentle rains during December and January. The mean annual air temperature is 60 to 67 degrees F. The frost-free period is 180 to 230 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Tombstone, Elgin, Stronghold, Mabray, Forrest, and Bonita soils. Tombstone, Elgin, Stronghold, Forrest, and Bonita soils are all very deep. Mabray soil is very shallow and shallow to bedrock.

DRAINAGE AND PERMEABILITY: Well drained; medium to high runoff; moderately rapid permeability.

USE AND VEGETATION: Used for livestock grazing and wildlife habitat. Vegetation includes sideoats grama, cane beardgrass, hairy grama, fluff grass, black grama, and yucca.

DISTRIBUTION AND EXTENT: Southeastern Arizona. MLRA is 41. Pedregosa soils are of minor extent.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Cochise County, Arizona; Soil Survey of Cochise County, Arizona, Douglas-Tombstone Part; 2000.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 1 inch (A horizon)

Calcic horizon - The zone from 0 to 7 inches (A and Bk horizons)

Petrocalcic horizon - The zone from 7 to 13 inches (Bkm horizon)

Classified according to Soil Taxonomy, Second Edition, 1999; Keys to Soil Taxonomy, Tenth Edition, 2006.

Updated competing series section 3/17/08, CEM

National Cooperative Soil Survey
U.S.A.


83


S85AZ 003 83

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-084 (Pedon 84)                            (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : EPITAPH              ; FINE, SMECTITIC, THERMIC PETROCALCIC CALCITORRERT
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 829, SAMPLES 86P4989-4992                                                        SOIL CONSERVATION SERVICE
Location:
Latitude: 31-41-28.65-N                                                    Longitude: 109-59-40.09-W
Elevation: 1455 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC    - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20    -75     75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-   10  A           28.1  25.7  46.1                                 9.4  13.4   8.4   7.4   7.4  0.52  1.55   91.7   1.0   94
86P4989S 10-  25  BT1         48.1  56.4  25.5                                 6.7   6.7   5.7   3.7   3.7  1.37  3.12   1.0    1.0   96
86P4990S 25-  40  BT2         51.5  25.1  23.5                                 6.3   6.3   5.3   3.3   3.3  12.1  2.8    2.0    0.0   17
86P4991  40-  53  BT3         55.5  25.1  19.5                                 5.9   4.9   2.9   2.9   2.9  20.1  0.98   1.0    0.0   22
         53-  93  2BK1        23.5  51.7  24.8                                 6.0   5.0   5.0   4.0   5.0  4.42  7.64   71.4   1.0   84
86P4992S 93-  134 2BK         24.0  40.4  35.5                                 9.1  10.1   8.1   5.1   3.1  2.39  2.12   41.7   1.0   46
         134- 180 3BK3        26.1  32.8  41.1                                 6.0  16.0   9.1   6.0   4.0  5.54  13.5   53.5  21.0  73
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT  PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
 0-   10  1.04 0.49  0.042                                                  1.22
 10-  25  1.21 0.40  0.030                                                         1.23  1.50  0.068              28.9
 25-  40  1.03 0.36  0.029                                                         1.29  1.77  0.111              34.0
 40-  53  0.98 0.40  0.034                                                         1.23  1.80  0.135              37.5
 53-  93  0.54 0.32  0.038
 93- 134  0.20 0.25  0.023                                                         1.39  1.46  0.017              26.0
 134-180  0.21 0.26  0.017
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                               ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-084
SAMPLED AS    : EPITAPH             ; FINE, SMECTITIC, THERMIC PETROCALCIC CALCITORRERT
NATIONAL SOIL SURVEY LABORATORY     ; PEDON 86P 829, SAMPLE 86P4989-4992

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL    SUM   NH4-  BASES   EC   CA    MG    NA     K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                           PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                        8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <---–MEQ/L----->
  0-  10    34.0  2.36  0.38  2.04                          53.4          750  3.05  0.42  0.92  0.21  0.007  0.17  1.437   0.54  0.26  1.09  7.65
 10-  25    51.9  3.36  2.41  1.05                          52.2          900  1.05  0.22  4.33  0.08  0.037  0.07  1.247   0.53  0.34  1.91  7.73
 25-  40    41.8  4.91  5.25  1.02                          47.0         1160  1.16  0.21  6.53  0.04  0.007  0.09  1.674   1.43  0.69  1.99  7.81
 40-  53    33.4  5.02  5.01  0.93                          50.3         5840  8.14  1.05  26.9  0.09  0.004  0.20  4.373   7.03  7.03  1.13  7.40
 53-  93    40.5  4.61  5.18  0.83                          32.7        18500  31.7  4.72  58.4  0.31  0.003  0.26  1.231   7.41  13.1  1.05  7.25
 93- 134    32.4  6.39  5.39  1.09                          56.9        10200  10.7  3.41  21.4  0.37  0.046  0.28  0.632   7.26  29.5  0.93  7.49
 134-180    36.6  12.5  1.39  2.50                          45.9        10100  6.80  3.18  584   0.47  0.036  0.19  0.900   7.19  35.3  1.13  7.34
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NARRATIVE PEDON DESCRIPTION

Pedon: Epitaph   NSSL Pedon Number: 86P0829
Soil Survey Number S85-AZ-003-084
Location: Cochise County, Arizona
660' W and 2100' N of the SE corner of Sec. 16, T.20S., R.23E. Approximate
Latitude: 31-41-28.65-N   Longitude: 109-59-40.09-W
Slope: 5% plane west facing   Elevation: 1455 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0   Permeability: Slow
Drainage: Well drained   Land Use:
Stoniness: Erosion or Deposition: Slight   Runoff:
Parent Material:
Classification: Fine, smectitic, thermic Petrocalcic Calcitorrert
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman   Sample Date: 09/85

75% of surface covered by rock fragments, mostly pebbles, 5 mm wide crakc to 41 cm at 15 to 25 cm intervals. 1/8 tp 1/4 thick crust on surface of soil.

A -- 0 to 10 cm; dry silty clay loam; very dark brown (10YR 2/2) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; few medium roots; many very fine interstitial and few medium tubular pores; strongly effervescent; moderately alkaline (pH=8.2); clear wavy boundary.

Bt1 -- 10 to 25 cm; dry silty clay; very dark gray (10YR 3/1) moist; moderate very fine subangular blocky structure; hard, firm, sticky, plastic; few medium roots; few medium tubular pores; patchy prominent clay films on faces of peds and patchy prominent pressure faces on vertical faces of peds; strongly effervescent; strongly alkaline (pH=8.4); clear wavy boundary. Few very fine irregular lime masses.

Bt2 -- 25 to 41 cm; dry clay; dark yellowish brown (10YR 3/4) moist; weak medium prismatic structure parting to moderate fine angular blocky; hard, very firm, sticky, plastic; few medium roots; few fine tubular pores; patchy distinct clay films on faces of peds and patchy distinct pressure faces on vertical faces of peds; strongly effervescent; strongly alkaline (pH=8.4); clear wavy boundary. Few very fine irregular lime masses.

Bt3 -- 41 to 53 cm; dry clay; very dark grayish brown (10YR 3/2) moist; moderate fine angular blocky structure; hard, very firm, sticky, plastic; few medium roots; few fine tubular pores; patchy faint clay films on faces of peds and patchy faint pressure faces on vertical faces of peds; strongly effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Few very fine irregular lime masses.

2Bk -- 53 to 91 cm; strong brown (7.5YR 5/6) dry loam; strong brown (7.5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots; few fine tubular pores; violently effervescent; strongly alkaline (pH=8.4). Common fine irregular lime masses and nodules; rocks coated on all sides.

2Bk -- 91 to 109 cm; strong brown (7.5YR 5/6) dry loam; strong brown (7.5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots; few fine tubular pores; violently effervescent; strongly alkaline (pH=8.4). Common fine irregular lime masses and nodules; rocks coated on all sides.

2Bk --109 to 183 cm; strong brown (7.5YR 5/6) dry loam; strong brown (7.5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots; few fine tubular pores; violently effervescent; strongly alkaline (pH=8.4). Common fine irregular lime masses and nodules; rocks coated on all sides.


S85AZ 003 84
1
2
3


S85AZ 003 84
1
2
3
4
5

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-085 (Pedon 85)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : LUCKYHILLS           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 830, SAMPLES 86P4993-4995                                                       SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-26.05-N                                                     Longitude: 110-03-10.33-W
Elevation: 1357 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT  .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20    -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0- 8     A           17.5  18.1  64.4                                9.1  16.1  14.1  11.1  14.1  14.1  21.1  12.0   0.0   47
         8- 30    BK1         24.8  23.1  52.1                                7.8  10.8   9.8   9.8  13.8  13.4  20.9   7.7   0.0   42
86P4993S 30-53    BK2         18.8  25.1  56.1                                9.0  16.0  13.0   9.0   9.0  22.0  10.7   0.0   0.0   33
86P4994S 53-76    2BK3        23.5  35.1  41.5                                9.1  12.1   8.1   6.1   6.1  22.8   8.1   0.0   0.0   32
86P4995S 76-152   2BK4        18.1  29.1  52.8                               12.4  13.4   9.4   8.4   9.4  24.1  29.6   0.0   0.0   54
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC    BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5   4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 8     0.91 0.39  0.017                                                  1.04
  8- 30    0.94 0.33  0.016
  30- 53   0.37 0.17  0.019                                                         1.73  1.83 0.019              13.5
  53- 76   0.32 0.24  0.022                                                         1.51  1.64 0.028              17.9
  76-152   0.22 0.26  0.029                                                         1.85  2.01 0.028              12.5
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-085
SAMPLED AS    : LUCKYHILLS           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 830, SAMPLE 86P4993-4995

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES   EC   CA    MG    NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                        PASTE
 (CM)       6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                       8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0- 8       30.6 1.75  0.55 0.96                         34.0        1035  3.96  0.58  0.63  0.25  0.006  0.21  1.168   0.78  0.98  1.60  7.74
  8- 30      32.4 1.65  0.24 0.22                         34.2         700  3.79  0.48  0.63  0.05  0.003  0.19  -.-     0.63  0.51  1.49  7.73
  30- 53     34.2 2.56  0.21 0.31                         31.6         632  2.84  0.54  0.43  0.04  0.002  0.20  0.789   0.64  0.41  0.17  7.88
  53- 76     36.2 4.23  0.46 0.48                         30.1         890  2.89  0.68  1.56  0.06  0.003  0.17  1.153   1.16  0.70  1.28  7.83
  76-152     31.3 4.45  0.97 0.37                         28.3        2400  4.40  1.12  6.34  0.09  0.006  0.25  1.263   1.96  1.05  1.23  7.98
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NARRATIVE PEDON DESCRIPTION

Pedon: Luchyhills NSSL Pedon Number: 86P0830
Soil Survey Number S85-AZ-003-085
Location: Cochise County, Arizona
2415' E and 1420' S of the NW corner of Sec. 36, T.19S., R.22E. Approximate.
Latitude: 31-44-26.05-N Longitude: 110-03-10.33-W
Physiography: terracettes in
Slope: 8% convex west facing Elevation: 1357 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0 Permeability: Moderate
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman Sample Date: 11/85

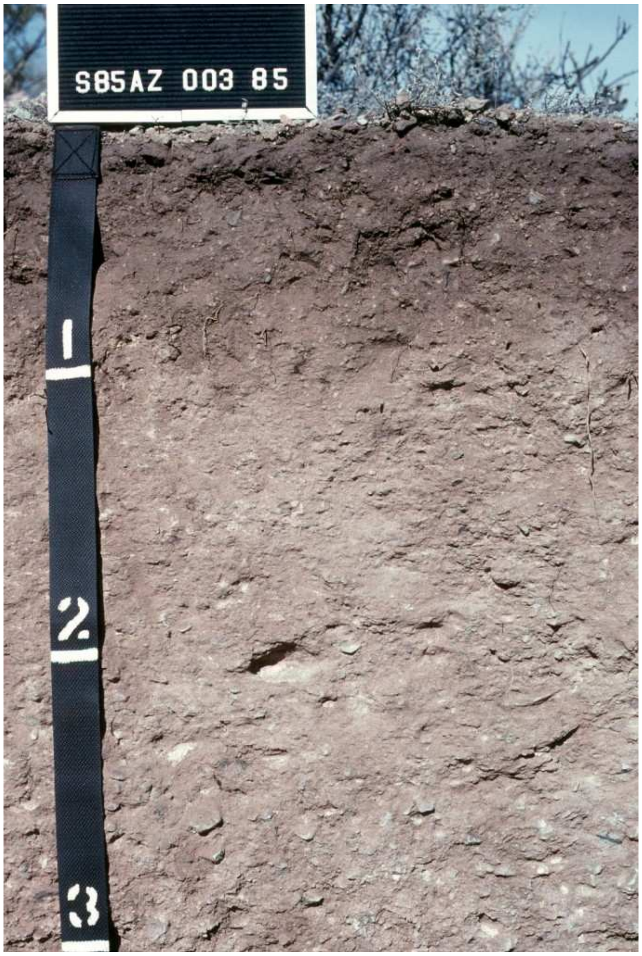
A -- 0 to 8 cm; (7.5YR 5/3) dry gravelly sandy loam; brown to dark brown (7.5YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 30 percent pebbles; abrupt wavy boundary.

Bk1 -- 8 to 30 cm; light brown (7.5YR 6/4) dry very gravelly sandy loam; brown (7.5YR 5/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few fine tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 60 percent pebbles; clear wavy boundary. Lime accumulations in root channels and pores.

Bk2 -- 30 to 53 cm; light brown (7.5YR 6/4) dry sandy loam; brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, very friable, nonsticky, nonplastic; few fine roots; few fine tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 12 percent pebbles; abrupt wavy boundary. Lime accumulations in root channels and pores.

2Bk3 -- 53 to 76 cm; light brown (7.5YR 6/4) dry silt loam; brown (7.5YR 5/4) moist; weak fine subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 12 percent pebbles; clear wavy boundary. Many large lime accumulations; weakly cemented.

2Bk4 -- 76 to 152 cm; light brown (7.5YR 6/4) dry gravelly silt loam; brown (7.5YR 5/4) moist; very hard, friable, nonsticky, nonplastic; few fine roots; few medium tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 30 percent pebbles. Lime accumulations in root channels and pores.


S85AZ 003 85
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S85AZ 003 85
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-086 (Pedon 86)                            (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : McALLISTER           ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                           U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 831, SAMPLES 86P4996-4999                                                   SOIL CONSERVATION SERVICE
Location:
Latitude: 31-43-53.64-N                                                    Longitude: 110-01-23.30-W
Elevation: 1395 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                          NATIONAL SOIL SURVEY LABORATORY
                                                                                               LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT   .002  .02   .05   .10   .25    .5     1    2     5     20    .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-   5   A           12.8  14.4  72.8                               9.4  23.4  16.4  10.4  13.4  11.1  18.2  18.0   0.0   47
86P4996S 5-  15   BT1         37.5  13.7  48.8                               6.8  10.8  8.8   8.8   13.8  23.3  26.4  1.1    0.0   60
86P4997S 15- 43   BT2         27.5  9.7   62.8                               5.8  11.8  12.8  12.8  19.8  24.9  22.1  1.0    0.0   48
         43- 74   2BK         10.1  11.7  78.1                               8.0  18.0  17.0  15.0  20.0  21.5  25.2  5.9    0.0   53
86P4998S 74- 114  3CK1        6.1   16.4  77.5                               8.5  19.5  16.5  15.5  17.5  20.8  15.3  1.0    0.0   37
86P4999S 114-152  3CK2        6.8   7.1   86.1                               6.6  16.6  21.6  19.6  21.6  23.4  14.8  1.1    0.0   39
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    0.97  0.38  0.013                                                 1.86
  5-  15   1.44  0.43  0.014                                                        1.50  1.70  0.043              16.5
  15- 43   0.92  0.35  0.014                                                        2.04  2.23  0.030              9.1
  43- 74   0.29  0.23  0.007
  74- 114  0.19  0.21  0.008                                                        1.77  1.79  0.004              10.3
  114-152  0.18  0.22  0.008                                                        1.88  1.92  0.007              5.7
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                                  ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-086
SAMPLED AS    : McALLISTER           ; FINE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC CALCIARGID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 831, SAMPLE 86P4996-4999

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL    SUM   NH4-  BASES   EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES               CATS   OAC  + AL   8A3A                                                          PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                        8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L--------->< UEQ/L> <----MEQ/L----->
  0-  5     8.56 1.86  0.10 1.36                          31.6        1000 4.78 0.88 0.31 0.45 0.008 0.22 2.258  0.66 0.32 2.70 7.67
  5-  15    18.7 4.42  0.13 1.17                          68.1         720 2.28 0.69 0.23 0.08 0.002 0.21 1.247  0.45 0.27 1.64 7.75
  15- 43    33.0 3.77  0.13 1.00                          43.3         883 3.76 0.73 0.41 0.11 0.002 0.82 1.689  0.88 0.42 1.80 7.61
  43- 74    33.8 2.28  0.13 0.59                          19.5        1790 8.00 1.18 0.97 0.25 0.006 0.35 1.026  1.95 1.58 1.06 7.53
  74- 114   30.8 3.46  0.16 0.69                          18.2         675 2.61 0.79 0.59 0.20 0.003 0.19 0.474  1.08 0.41 1.19 7.77
  114-152   18.9 4.04  0.35 0.98                          16.9         964 2.22 1.03 1.61 0.38 0.002 0.14 0.379  1.75 0.20 1.34 7.87
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NARRATIVE PEDON DESCRIPTION

Pedon: McAllister
NSSL Pedon Number: 86P0831
Soil Survey Number S85-AZ-003-086
Location: Cochise County, Arizona
525' N and 1100' E of SW corner of Sec. 32, T.29S., R.23E. E of Bennett Rd. W of simulated plot. Approximate.
Latitude: 31-43-53.64-N
Longitude: 110-01-23.30-W
Physiography: terracettes in
Slope: 5% convex northwest facing
Elevation: 1395 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0
Permeability: Moderate
Drainage: Well drained
Land Use:
Stoniness:
Erosion or Deposition: Slight
Runoff:
Parent Material:
Classification: Fine-loamy, mixed, superactive, thermic Ustic Calciargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman
Sample Date: 10/85

A -- 0 to 5 cm; strong brown (7.5YR 5/6) dry gravelly sandy loam; (7.5YR 3/3)own moist; moderate coarse platy structure; hard, very friable, slightly sticky, nonplastic; few coarse roots; few fine vesicular pores and; neutral (pH=7.2); 18 percent pebbles; abrupt smooth boundary.

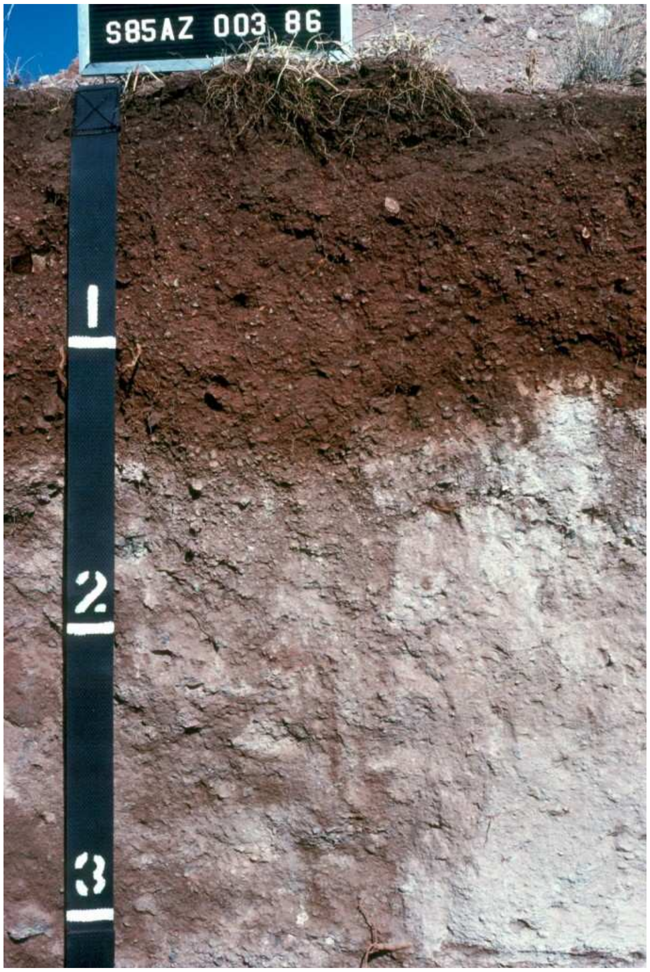
Bt1 -- 5 to 15 cm; reddish brown (5YR 4/3) dry very gravelly sandy clay loam; dark reddish brown (5YR 3/3) moist; moderate very fine subangular blocky structure; hard, friable, sticky, plastic; few coarse roots; few fine tubular pores and; neutral (pH=7.2); 50 percent pebbles; clear wavy boundary. Thin discontinuous clay films on faces of peds.

Bt2 -- 15 to 43 cm; reddish brown (5YR 4/3) dry gravelly sandy clay loam; dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky, nonplastic; many medium roots; few fine tubular pores and; mildly alkaline (pH=7.4); 50 percent pebbles; abrupt wavy boundary. Thick discontinuous clay films on faces of peds.

2Bk -- 43 to 74 cm; light reddish brown (5YR 6/3) dry gravelly sandy loam; reddish brown (5YR 5/3) moist; weak medium subangular blocky structure; very hard, friable, nonsticky, nonplastic; few fine roots; few fine tubular pores and; violently effervescent; moderately alkaline (pH=8.2); 60 percent pebbles; clear wavy boundary.

3Ck1 -- 74 to 114 cm; light reddish brown (5YR 6/3) dry gravelly loamy sand; reddish brown (5YR 5/3) moist; very hard, firm, nonsticky, nonplastic; few fine roots and; violently effervescent; moderately alkaline (pH=8.2); 45 percent pebbles; clear wavy boundary. Weakly stratified.

3Ck2 --114 to 152 cm; light reddish brown (5YR 6/3) dry very gravelly loamy coarse sand; reddish brown (5YR 5/3) moist; very hard, firm, nonsticky, nonplastic and; violently effervescent; strongly alkaline (pH=8.4); 40 percent pebbles. Weakly stratified.


S85AZ 003 86
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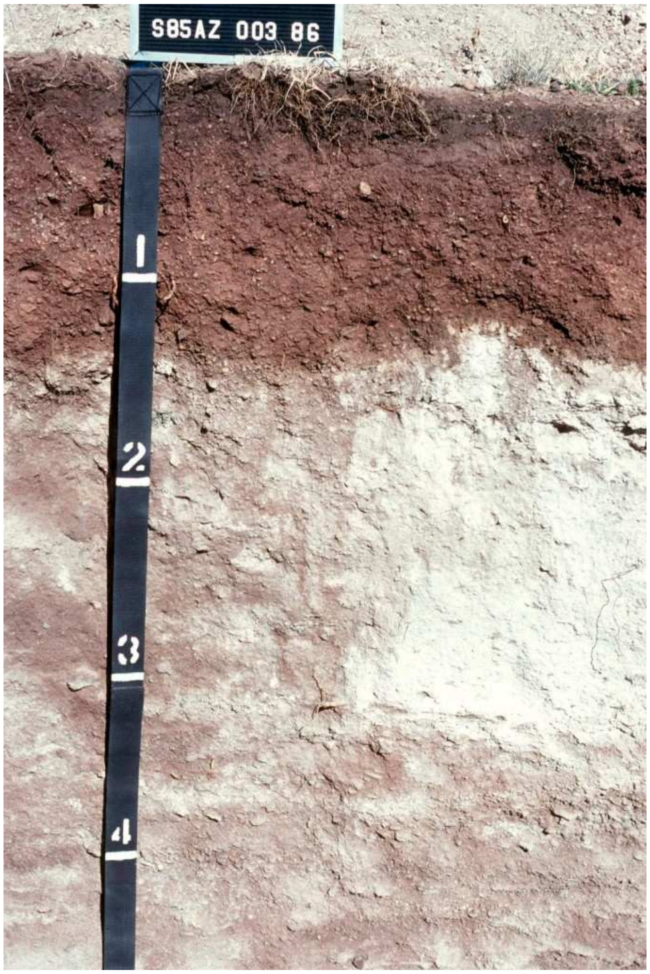
S85AZ 003 86
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-087 (Pedon 87)                             (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : GRAHAM               ; CLAYEY, SMECTITIC, THERMIC LITHIC USTIC HAPLARGID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 832, SAMPLES 86P5000-5001                                                        SOIL CONSERVATION SERVICE
Location:
Latitude: 31-42-05.75-N                                                     Longitude: 109-59-42.76-W
Elevation: 1461 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
          0-  10   A          28.8  38.0  33.2                                   11.2  7.2   5.2   4.2   5.2   2.1   9.2   37.5  26.0  49
86P5000S 10- 23   BT1         55.5  23.7  20.8                                   6.16  5.1   3.1   3.1   3.1   2.4   7.1   10.5  0.0   21
86P5001S 23- 38   BT2         64.1  20.4  15.5                                   4.5   3.5   2.5   2.5   2.5   0.4   1.7   5.6   1.0   9
         38- 48   BTS         56.8  22.4  20.8                                   4.8   4.8   3.8   3.8   3.8   6.5   18.0  28.0  1.0   53
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->           PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  10   1.76  0.47  0.017
 10- 23    1.24  0.39  0.018                                                         1.18  1.81  0.153              39.5
 23- 38    1.12  0.34  0.014                                                         1.16  1.85  0.168              41.4
 38- 48    1.20  0.36  0.020
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-087
SAMPLED AS    : GRAHAM              ; CLAYEY, SMECTITIC, THERMIC LITHIC USTIC HAPLARGID
NATIONAL SOIL SURVEY LABORATORY     ; PEDON 86P 832, SAMPLE 86P5000-5001

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                            PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B       6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                        8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <---–MEQ/L----->
  0-  10    10.0  5.28   0.79 1.85                          47.0        1570  4.22  1.25 2.44  0.62 0.007  0.25  1.405  1.22  0.64  3.74 8.04
  10- 23    28.0  13.8   4.49 1.56                          30.5        1305  1.21  0.54 6.71  0.14 0.008  0.12  2.858  1.16  0.91  2.75 7.89
  23- 38    38.8  15.1   4.23 1.27                          72.9        2230  1.31  0.63 10.8  0.11 0.012  0.06  0.632  1.90  2.32  1.90 7.63
  38- 48    24.6  10.5   5.51 1.13                          49.4        2900  1.98  0.90 14.1  0.13 0.019  0.18  2.210  1.97  2.98  1.89 7.52
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NARRATIVE PEDON DESCRIPTION

Pedon: Graham NSSL Pedon Number: 86P0832
Soil Survey Number S85-AZ-003-087
Location: Cochise County, Arizona
525' E and 250' S of the NW corner of Sec. 15, T.20S., R.23E. Approximate.
Latitude: 31-41-05.75-N Longitude: 109-59-42.76-W
Physiography: Hillside or mountainside in
Slope: 8% convex south facing Elevation: 1461 m MSL
Precipitation: cm - Aridic Moisture Regime.
Water Table Depth: 0 Permeability: Slow
Drainage: Well drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Clayey, smectitic, thermic lithic Ustic Haplargid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman Sample Date: 11/85
65% of surface covewred with rock fragments. 40% of which are cobbles.

A -- 0 to 10 cm; brown to dark brown (7.5YR 4/2) dry very cobbly clay loam; dark brown (7.5YR 3/2) moist; moderate very fine granular structure; hard, very friable, sticky, plastic; many medium roots; few medium vesicular pores; slightly effervescent; mildly alkaline (pH=7.6); clear wavy boundary.

Bt1 -- 10 to 23 cm; reddish brown (5YR 4/3) dry clay; dark reddish brown (5YR 3/3) moist; moderate very fine angular blocky structure; hard, friable, sticky, plastic; many medium roots; few medium tubular pores; slightly effervescent; moderately alkaline (pH=7.8); clear wavy boundary. 2 to 5% pebbles. Clay flows in root channels and pores.

Bt2 -- 23 to 38 cm; reddish brown (5YR 4/4) dry clay; dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; very hard, very firm, slightly sticky, slightly plastic; few medium roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH=8.0); clear wavy boundary. Clay films thin discontinuous on all faces of peds; pressure faces on horizontal faces. 3 to 5% pebbles.

Bt3 -- 38 to 48 cm; dark reddish gray (5YR 4/2) dry clay; dark reddish brown (5YR 3/2) moist; strong fine angular blocky structure; very hard, very firm, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; slightly effervescent; moderately alkaline (pH=8.0); abrupt wavy boundary. Clay films thin discontinuous on all faces of peds; pressure faces on horizontal faces.

2R -- 48 to 48 cm; dry. Andesite.


S85AZ 003 87
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S85AZ 003 87
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                            ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-088 (Pedon 88)                              (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : WOODCUTTER          ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC ARIDIC LITHIC ARGIUSTOLL
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                  U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 833, SAMPLES 86P5002-5002                                                          SOIL CONSERVATION SERVICE
Location:
Latitude: 31-46-16-N Approximate                                                      Longitude: 109-53-12-W Approximate
Elevation: 1719 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                                 NATIONAL SOIL SURVEY LABORATORY
                                                                                                      LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2     5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A           14.1  25.1   60.8                           6.4   10.4   13.4  14.4  16.4  21.5  16.1   0.0   0.0   38
86P5002S 5-  20   BT          18.8  15.1   66.1                           4.0   8.0    12.0  20.0  22.0  30.9  31.9   0.0   0.0   63
         20- 38   CR          18.1  13.7   69.1                           5.6   9.6    14.6  18.6  19.6  37.6  28.4   0.0   0.0   66
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
         <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
 0- 5      1.21 0.34  0.014                                                 1.23
 5- 20     1.04 0.26  0.010                                                        1.71  1.79  0.015              9.3
 20-38     0.63 0.300 0.013
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        AVERAGES,   DEPTH   5- 20:  PCT CLAY    0  PCT  .1-75MM     0
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                              ***   PRIMARY   CHARACTERIZATION   DATA   ***

S85AZ-003-088
SAMPLED AS    : WOODCUTTER           ; LOAMY-SKELETAL, MIXED, SUPERACTIVE, THERMIC ARIDIC LITHIC ARGIUSTOLL
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 833, SAMPLE 86P5002-5002

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                           PASTE
 (CM)       6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                       8C1B
            <- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0- 5      4.40  2.46  0.12  0.43                          24.4         577  1.41 0.58  0.28 0.15  0.003 0.27  1.074   0.52 0.41  10.8 7.36
  5- 20     7.04  5.54  0.15  0.27                          33.6         640  2.17 1.01  0.64 0.09  0.008 0.19  0.726   0.75 0.46  1.06 7.10
  20-38     6.96  5.85  0.22  0.13                          31.78        860  2.51 1.00  0.93 0.07  0.015 0.24  1.579   0.99 0.41  1.66 7.13
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NARRATIVE PEDON DESCRIPTION

Pedon: Woodcutter NSSL Pedon Number: 86P0833
Soil Survey Number S85-AZ-003-088
Location: Cochise County, Arizona
1320' W nd 610' S of the NE corner of Sec. 22, T.19S., R.24E. Approximate.
Latitude: 31-46-16-N Longitude: 109-53-12-W Approximate.
Slope: 18% convex northeast facing Elevation: 1719 m MSL
Precipitation: cm - Ustic Moisture Regime.
Water Table Depth: 0 Permeability: Moderate
Drainage: Somewhat excessively drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Loamy-skeletal, mixed, superactive, thermic Aridic Lithic Argiustoll
Diagnostic Horizons:
Described By: Carl Glocker and Dr. William Emmerich Sample Date: 11/85
100 percent of surface covered by fine angular pebbles.

A -- 0 to 5 cm; brown to dark brown (7.5YR 4/2) dry extremely gravelly sandy loam; dark brown (7.5YR 3/2) moist; moderate very fine angular blocky structure; hard, friable, nonsticky, nonplastic; few medium roots; many coarse interstitial pores; mildly alkaline (pH=7.4); abrupt wavy boundary. Pebbles are very fine and fine and angular. Upper 1/4 has a fine vescular crust.

Bt -- 5 to 20 cm; reddish brown (5YR 4/3) dry very gravelly sandy clay loam; dark reddish brown (5YR 3/4) moist; moderate fine angular blocky structure; , friable, slightly sticky, slightly plastic; few medium roots; few medium interstitial pores; mildly alkaline (pH=7.6); abrupt wavy boundary. Thin patchy clay films on faces of peds and coatings pebbles. Pebbles are very fine and fine and angular.

2Cr -- 20 to 38 cm; dry; few fine roots; gradual wavy boundary. Saprolite

2R -- 38 to 38 cm; dry. Granite


S85AZ 003 88

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-089 (Pedpn 89)                                   (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : SUTHERLAND          ; LOAMY-SKELETAL, CARBONATIC, THERMIC SHALLOW CALCIC PETROCALCID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                          U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 834, SAMPLES 86P5003-5007                                                  SOIL CONSERVATION SERVICE
Location:
Latitude: 31-41-56.99-N                                                   Longitude: 110-02-23.34-W
Elevation: 1416 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                         NATIONAL SOIL SURVEY LABORATORY
                                                                                              LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

86P5003S   0-  5   A          15.8  26.4  57.8         0.6  13.7  12.7  12.4  16.4  12.0   8.1   8.9  10    19    11      67  40
86P5004S   5- 23   BW1        20.7  27.8  51.5         2.9  16.6  11.2  11.0  14.5   9.6   7.6   8.8   8    14    33      73  62
86P5005S  23- 43   BW2        20.3  31.4  48.3         7.4  19.6  11.8  10.3  11.5   8.4   8.6   9.5   7    18    34      75  66
86P5006S  43- 97  2BK1        13.4  34.2  52.4         3.1  20.2  14.0  12.7  13.5   9.4   8.2   8.6   6    23    37      79  72
86P5007S  97-153  2BK2         8.9  35.0  56.1         1.1  22.1  12.9  10.7  10.1   8.7  10.2  16.4   8    25    41      86  77

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            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                               FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1C  6B3A   6S3  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A3A  4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2a  4C1
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

  0-  5     1.20                                      0.67  0.49                                                          7.7
  5- 23     1.34                                      0.57  0.47                    1.34  1.39 0.007             18.8   9.8  0.07
 23- 43     0.96                                      0.42  0.39                    1.32  1.36 0.005             22.5   8.0  0.10
 43- 97     0.42                                      0.47  0.39                                                          5.2
 97-153     0.14                                      0.74  0.49                                                          4.4
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*** PRIMARY CHARACTERIZATION DATA ***

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S85AZ-003-089 (Pedon 89)
SAMPLED AS    : SUTHERLAND           ; LOAMY-SKELETAL, CARBONATIC, THERMIC SHALLOW CALCIC PETROCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 834, SAMPLE 86P5003-5007

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID-      (- -CEC-  -) EXCH   SAR     BASE    CO3 AS RES.   CASO4 AS  (- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY        SUM   NH4-   NA        SATURATION  CACO3 OHMS    GYPSUM    SAT  CACL2  H2O
 DEPTH      5B5A  5B5A  5B5A  5B5A BASES              CATS   OAC              SUM NH4OAC <2MM   /CM  <2MM <20MM PASTE  .01M
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A        5A3A  5A8B  5B5B    5E   5C3   5C1  6E1G  8E1   6F1A  6F4  8C1B  8C1F  8C1F
            <- - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   PCT        <- -PCT- >  PCT         <- -PCT ->         1:2  1:1
  0-  5            0.9   0.1   0.7                          10.6     1    TR                29  1325               7.8   7.5   8.1
  5- 23            1.0    TR   0.5                          11.8    TR    TR                35  1325               7.8   7.5   8.1
 23- 43            0.8    TR   0.3                           8.5     1                      50                           7.5   8.0
 43- 97            0.7    TR   0.2                           6.3     1                      52                           7.6   8.1
 97-153            1.1   0.1   0.2                           6.6     1                      48                           7.7   8.2

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           (- - - - - - - -WATER EXTRACTED FROM SATURATED PASTE- - - - - - - - - -)
                                                                       TOTAL ELEC.
             CA    MG    NA     K    CO3  HCO3   CL    SO4   NO3  H2O  SALTS COND.
 DEPTH                                                                  EST.  8A3A
  (CM)      6N1B  6O1B  6P1B  6Q1B  6I1B  6J1B  6K1C  6L1C  6M1C   8A   8D5  MMHOS
           < - - - - - - - - - - - -MEQ / LITER - - - - - - - - - - > <- -PCT ->  /CM

  0-  5      5.1   0.4   0.2   0.4    --   4.4   0.2   0.9    --  31.3    TR  0.58
  5- 23      4.3   0.3   0.2   0.2    --   3.6   0.2   0.7    --  39.7    TR  0.47
 23- 43                                                                       0.24
 43- 97                                                                       0.20
 97-153                                                                       0.22

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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  3,  4,  5,
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-089-2*                                (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : SUTHERLAND          ; LOAMY-SKELETAL, CARBONATIC, THERMIC SHALLOW CALCIC PETROCALCID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 834, SAMPLES 86P5003-5007                                                        SOIL CONSERVATION SERVICE
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT   .002  .02   .05   .10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A           16.8  27.7  55.5                                  9.5  12.5   12.5  9.5   11.5  11.1  22.8   10.3   0.0   44
         5- 23    BW1         18.1  31.7  50.1                                  8.6  11.6   10.6  8.6   10.6  7.4   13.4   31.9   0.0   53
         23- 43   BW2         22.1  29.7  48.1                                  7.8  9.8    9.8   9.8   10.8  8.6   17.9   32.0   0.0   59
         43- 97   2BK1        23.2  34.1  42.7                                  8.1  9.1    9.1   7.1   9.1   7.9   21.9   36.3   0.0   66
         97-153   2BK2        13.9  34.8  51.3                                  9.1  11.1   10.1  9.1   12.1  8.8   24.0   40.6   0.0   73

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
  (CM)      6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    1.43  0.38  0.016                         0.67  0.49              1.21                                     7.7
  5- 23    1.54  0.44  0.023                         0.57  0.47                     1.34  1.39  0.007             18.8  9.8   0.07
 23- 43    1.27  0.37  0.022                         0.42  0.39                     1.32  1.36  0.005             22.5  8.0   0.10
 43- 97    0.47  0.26  0.011                         0.47  0.39                                                         5.2
 97-153    0.26  0.29  0.011                         0.74  0.49                                                         4.4
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-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC

*** PRIMARY CHARACTERIZATION DATA ***

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S85AZ-003-089-2*
SAMPLED AS    : SUTHERLAND           ; LOAMY-SKELETAL, CARBONATIC, THERMIC SHALLOW CALCIC PETROCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 834, SAMPLE 86P5003-5007

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------   PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                          PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                      8C1B
            <- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   /CM  <------------------MEQ/L--------->< UEQ/L> <---—MEQ/L----->
  0- 5      33.4  1.19   -.-  0.92                          31.4         772  4.95  0.67  0.28  0.40  0.126  0.28  1.231   0.67  0.25  0.48  7.43
  5- 23     39.1  0.96  0.02  0.71                          40.0         800  5.77  0.51  0.34  0.15  0.008  0.17  0.789   0.56  0.26  1.95  7.79
  23-43     31.7  0.88  0.01  0.24                          28.8         795  4.67  0.49  0.30  0.09  0.004  0.29  1.468   0.99  0.34  1.59  7.57
  43-97     34.3  0.79  0.01  .021                          30.3         780  4.91  0.52  0.34  0.10  0.016  0.25  0.742   1.56  0.33  1.21  7.53
  97-153    34.9  1.53  0.08  0.19                          21.9         980  6.43  0.79  0.51  0.10  0.010  0.27  3.347   1.88  0.20  0.85  7.46
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-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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NARRATIVE PEDON DESCRIPTION

Pedon: Sutherland NSSL Pedon Number: 86P0834
Soil Survey Number S85-AZ-003-089
Location: Cochise County, Arizona
2940' E and 465' S of the NW corner of Sec. 18, T.20S., R.23E. Approximate.
Latitude: 31-41-56.99-N Longitude: 110-02-23.34-W
Physiography: terracettes in
Slope: 8% convex south facing Elevation: 1416 m MSL
Precipitation: cm - Ustic Moisture Regime.
Water Table Depth: 0 Permeability: Moderately rapid
Drainage: Somewhat excessively drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Loamy-skeletal, carbonatic, thermic shallow Calcic Petrocalcid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman Sample Date: 11/85
85% of surface covered with pebbles and a few pan frags.

A -- 0 to 5 cm; brown (10YR 5/3) dry very gravelly sandy loam; brown to dark brown (10YR 4/3) moist; weak coarse platy structure; soft, very friable, nonsticky, nonplastic; many medium roots; few medium vesicular pores; violently effervescent; moderately alkaline (pH=8.0); clear wavy boundary. Pebbles lime coated on undersides about 1% pan fragments. 16% CaCO3.

Bw1 -- 5 to 23 cm; brown (10YR 5/3) dry very gravelly sandy loam; brown to dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few fine vesicular pores and; violently effervescent; moderately alkaline (pH=8.2); 50 percent pebbles; clear wavy boundary. Pebbles lime coatings on undersides, about 1% pan fragments. 19% CaCO3.

Bw2 -- 23 to 43 cm; brown (10YR 5/3) dry very gravelly sandy loam; brown to dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 80 percent pebbles; clear wavy boundary. Pebles lime caoted on undersides about 1% pan fragments. Few fine rounded lime masses and nodules. 5% CaCO3.

2Bk1 -- 43 to 97 cm; pale brown (10YR 6/3) dry extremely cobbly sandy loam; yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium roots; few medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 30 percent pebbles; clear wavy boundary. Pebles lime coated on undersides about 1% pan fragments. Many large irregular lime masses and nodules, about 3% pan fragments. 45% CaCO3.

2Bk2 -- 97 to 152 cm; light gray (10YR 7/2) dry extremely cobbly sandy loam; pale brown (10YR 6/3) moist; soft, very friable, nonsticky, nonplastic; few fine roots; few coarse interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 80 percent pebbles. Pebbles lime coated on undersides about 1% pebbles. Many large irregular lime masses and nodules about 3% pan fragments. 27% CaCO3.


S85AZ 003 89
1
2


S85AZ 003 89
1
2
3
4

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-090 (Pedon 90)                           (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : MABRAY               ; LOAMY-SKELETAL, MIXED, CARBONATIC, THERMIC LITHIC Ustic TORRIORTHENT
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P                                                                                  SOIL CONSERVATION SERVICE
Location:
Latitude: 31-41-11.17-N                                                    Longitude: 110-01-40.49-W
Elevation: 1425 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC    - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0- 5     A           17.2  38.8  44.0                            13.4  9.4   5.4   6.4   9.4  8.7   28.0  9.7   0.0   47
         5- 18    C           17.9  37.5  44.7                            14.1  10.1  5.1   6.1   9.1  5.3   20.0  43.6  0.0   69
         18-38    2R          25.2  30.8  44.0                            10.4  8.4   6.4   7.4  11.4  9.6   22.8  25.0  1.0   58

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    1.74  0.59  0.022
  5- 18    3.08  0.77  0.031
 18- 38    2.09  0.56  0.028

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-090
SAMPLED AS    : MABRAY               ; LOAMY-SKELETAL, MIXED, CARBONATIC, THERMIC LITHIC Ustic TORRIORTHENT
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                           PASTE
 (CM)       6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                         8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L---------><UEQ/L> <---–MEQ/L----->
  0- 5       42.3 3.92  0.01 0.88                          48.3         835  4.17  0.69  0.17  0.16  0.033  0.23  1.974   1.19  0.23  1.57  7.78
  5- 18      31.6 3.08  0.03 0.27                          54.9         958  6.15  0.95  0.21  0.13  0.016  0.30  1.342   1.14  0.32  2.30  7.67
  18-38      37.3 3.24  0.04 0.21                          43.4        1222  5.81  1.03  0.34  0.09  0.003  0.33  1.721   1.68  0.46  2.24  7.54
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MABRAY SERIES TYPIC

The Mabray series consists of shallow and very shallow, well drained soils formed in slope alluvium from limestone. Mabray soils are on hills and mountains and have slopes of 3 to 70 percent. The mean annual precipitation is about 14 inches and the mean annual air temperature is about 61 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, carbonatic, thermic Lithic Ustic Torriorthents

TYPICAL PEDON: Mabray very gravelly loam - rangeland. (Colors are dry soil unless otherwise noted.)

A--0 to 1 inch; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; common fine and very fine irregular pores; 35 percent gravel and 15 percent cobble; violently effervescent; moderately alkaline (pH 8.0); abrupt smooth boundary. (1 to 3 inches thick)

ACk--1 to 12 inches; dark grayish brown (10YR 4/2) extremely cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common fine and very fine tubular pores; 30 percent gravel and 45 percent cobble; violently effervescent; common light gray (10YR 7/2) calcium carbonate coatings on underside of gravel and cobble; moderately alkaline (pH 8.2); abrupt irregular boundary. (3 to 17 inches thick)

2R--12 inches; extremely hard, fractured limestone; common fine roots along fractures.

TYPE LOCATION: Santa Cruz County, Arizona; approximately 10 miles east- southeast of Amado; 300 feet north of the Glove Mine and 1,250 feet north of the south 1/4 corner of section 30, T.20 S., R.13 E.

RANGE IN CHARACTERISTICS:

Soil moisture - Intermittently moist in some part of the soil moisture control section during July-September and December-March. Driest during May and June. The epipedon is moist in some part more than 90 days (cumulative) when the soil temperature is above 41 degrees F. in 7 out of 10 years. Ustic aridic soil moisture regime.

Soil temperature - 59 to 72 degrees F.

Rock fragments - 35 to 80 percent

Depth to bedrock - 4 to 20 inches

Organic matter content - 1 to 5 percent

Reaction - slightly to moderately alkaline

Calcium carbonate equivalent - greater than 40 percent based on whole soil less than 20 mm

Clay content - averages more than 18 percent in the control section. Ranges from 12 to 25 percent.

A horizon
Hue: 10YR, 7.5YR
Value: 2, 3, 4, or 5 dry, 2 or 3 moist
Chroma: 1 through 4, dry or moist

AC or C horizon
Hue: 10YR, 7.5YR
Value: 3 through 8 dry, 3 through 7 moist
Chroma: 1 through 4, dry or moist
Texture: silt loam, loam, sandy loam, fine sandy loam

Some pedons contain a layer less than 3 inches thick of weathered bedrock above the lithic contact.

COMPETING SERIES: These are no competing series.

GEOGRAPHIC SETTING: Mabray soils are on hills and mountains. Elevations range from 3,000 to 5,500 feet. Slopes range from 3 to 70 percent. They formed in slope alluvium from calcareous sedimentary rocks that includes limestone, marble and calcareous sandstone. Mean annual precipitation ranges from 12 to 16 inches as summer thundershowers and gentle winter rain and occasional snow. Mean annual air temperature ranges from 57 to 67 degrees F. The frost-free period is about 160 to 250 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Caralampi, Chiricahua, Deloro, Graham, Oracle and Romero soils. Caralampi soils are very deep. Chiricahua, Deloro, Graham and Oracle soils have argillic horizons. Romero soils have mixed mineralogy and a paralithic contact.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderate permeability.

USE AND VEGETATION: These soils are used for livestock grazing and wildlife habitat. Present vegetation is ocotillo, whitethorn, sandpaper bush, guajillo, catclaw, buckbrush, agave, sotol, beargrass, burroweed, snakeweed, some mesquite and palo verde, slim tridens, plains lovegrass, sideoats and hairy grama, black grama, New Mexico needlegrass, three-awn, fluffgrass and bullgrass.

DISTRIBUTION AND EXTENT: Southern and Central Arizona. The Mabray series is moderately extensive. This soil occurs in LRR-D, MLRA 41.

MLRA OFFICE RESPONSIBLE: Phoenix, Arizona

SERIES ESTABLISHED: Santa Cruz County Area, Arizona; 1971.

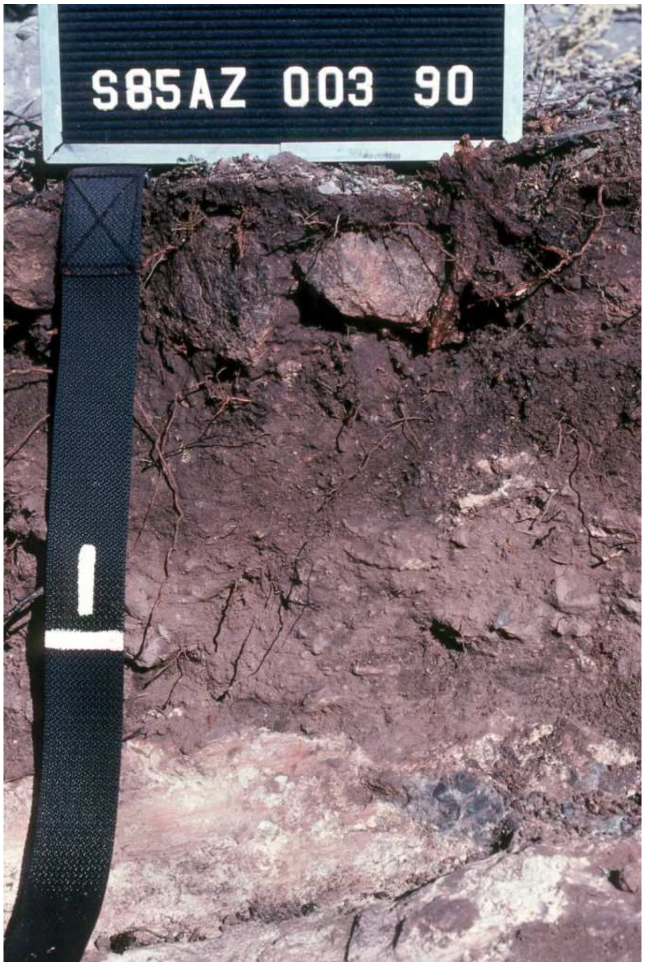
REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - The zone from 0 to 1 inch (A horizon)

Lithic contact - The boundary at 12 inches (2R horizon)

Classified according to Soil Taxonomy, Second Edition, 1999; Keys to Soil Taxonomy, Tenth Edition, 2006.


S85AZ 003 90


S85AZ 003 90

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-091 (Pedon 91)                          (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : STRONGHOLD           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 835, SAMPLES 86P5008-5014                                                        SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-54.79-N                                                    Longitude: 109-57-11.70-W
Elevation: 1537 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT   .002  .02   .05   .10   .25    .5     1    2     5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50    -1    -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

86P5008S   0-  8   A1         12.0  13.3  74.7         1.1   7.3   6.0  10.7  27.8  15.5   9.2  11.5  10    26    18      83  54
86P5009S   8- 20   A2         20.5  19.1  60.4         5.8  13.7   5.4   8.8  19.7  11.4   8.6  11.9  14    23    24      81  61
86P5010S  20- 38   BW1        18.9  24.0  57.1         3.2  16.4   7.6  12.0  19.4  10.5   6.7   8.5  12    25    31      82  68
86P5011S  38- 66  2BK1         8.6  21.8  69.6         1.1  14.1   7.7  11.6  20.4  13.4  12.7  11.5  14    26    17      82  57
86P5012S  66- 86  2BK2        12.5  20.0  67.5         3.4  13.4   6.6  10.7  20.3  14.8  11.4  10.3  19    28    25      88  72
86P5013S  86-117  2BK3         7.2  17.7  75.1         1.7  11.3   6.4  10.5  22.3  16.5  14.9  10.9   9    16    27      83  52
86P5014S 117-153  2BK4         5.7  14.1  80.2          --   7.7   6.4  12.0  29.3  20.5  10.9   7.5  11    26    32      90  69

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            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1C  6B3A   6S3  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A3A  4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2a  4C1
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

  0-  8     0.89                                     1.00  0.52                                                          6.2
  8- 20     1.42                                     0.74  0.53                    1.08  1.18    --               25.4  10.9  0.10
 20- 38     1.21                                     0.82  0.57                    1.18  1.28    --               29.3  10.8  0.11
 38- 66     0.47                                     1.87  0.93                    1.59  1.63 0.005               14.3   8.0  0.05
 66- 86     0.22                                     1.26  0.63                                                          7.9
 86-117     0.12                                     2.14  0.94                                                          6.8
117-153     0.04                                     2.67  1.07                                                          6.1
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        AVERAGES,   DEPTH  25-100:  PCT CLAY    9  PCT  .1-75MM    84
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*** PRIMARY CHARACTERIZATION DATA ***

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S85AZ-003-091
SAMPLED AS    : STRONGHOLD           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 835, SAMPLE 86P5008-5014

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID-      (- -CEC-  -) EXCH   SAR     BASE    CO3 AS RES.   CASO4 AS  (- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY         SUM   NH4-   NA          SATURATION  CACO3 OHMS    GYPSUM    SAT  CACL2  H2O
 DEPTH      5B5A  5B5A  5B5A  5B5A BASES               CATS   OAC                SUM NH4OAC <2MM   /CM  <2MM <20MM PASTE  .01M
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A        5A3A  5A8B  5B5B    5E   5C3   5C1  6E1G  8E1   6F1A   6F4  8C1B  8C1F  8C1F
            <- - - - - - - - - -MEQ / 100 G - - - - - - - - - - ->   PCT        <- -PCT- >   PCT        <- -PCT ->         1:2  1:1

  0-  8            1.1    TR   0.6                          12.0    TR    TR                18                   7.7   7.6   8.2
  8- 20            0.9    TR   0.3                          15.2    TR    TR                30  1325             7.7   7.5   8.0
 20- 38            0.9   0.1   0.2                          15.5    TR                      39                         7.5   8.1
 38- 66            1.2   0.1   0.2                          16.1    TR                      27                         7.6   8.2
 66- 86            2.2   0.1   0.2                          15.7     1                      32                         7.7   8.2
 86-117            3.2   0.3   0.3                          15.4     2                      28                         7.7   8.4
117-153            3.4   0.6   0.4                          15.2     4                      20                         7.8   8.6

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           (- - - - - - - -WATER EXTRACTED FROM SATURATED PASTE- - - - - - - - - -)
                                                                       TOTAL ELEC.
             CA    MG    NA     K   CO3  HCO3    CL   SO4   NO3  H2O  SALTS COND.
 DEPTH                                                                  EST.  8A3A
  (CM)      6N1B  6O1B  6P1B  6Q1B  6I1B  6J1B  6K1C  6L1C  6M1C    8A   8D5  MMHOS
           < - - - - - - - - - - - -MEQ / LITER - - - - - - - - - - > <- -PCT ->  /CM

  0-  8      6.8   0.6   0.1   0.5    --   6.1   0.2   0.9    --  30.6    TR  0.73
  8- 20      4.2   0.3   0.2   0.1    --   3.6   0.2   0.7    --  43.9    TR  0.46
 20- 38                                                                       0.24
 38- 66                                                                       0.19
 66- 86                                                                       0.20
 86-117                                                                       0.19
117-153                                                                       0.20

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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  3,  4,  5,  6,  7,
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                                *** P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A  ***
S85AZ-003-091-2*                                   (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : STRONGHOLD          ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                     ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 835, SAMPLES 86P5008-5014                                                       SOIL CONSERVATION SERVICE
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE   VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  8    A1          13.9  17.5  68.7                              8.3   22.3  15.3  10.3  12.3  11.2  23.4   18.0   0.0   53
         8- 20    A2          21.9  33.5  44.7                              5.7   14.7  8.7   5.7   9.7   13.2  18.2   22.2   0.0   54
         20- 38   BW1         21.9  21.5  56.7                              8.5   15.5  10.5  9.5   12.5  12.9  18.2   29.2   0.0   61
         38- 66   2BK1        13.2  20.8  66.0                              7.8   18.8  14.8  11.8  12.8  13.1  25.8   16.4   1.0   56
         66- 86   2BK2        15.2  21.5  63.3                              9.5   15.5  14.5  11.5  12.5  10.9  31.6   23.9   1.0   67
         86-117   2BK3        9.2   20.8  70.0                              8.0   19.0  19.0  12.0  12.0  9.7   23.6   25.8   1.0   59
         117-153  2BK4        5.9   14.8  79.3                              7.7   21.7  25.7  12.7  11.7  10.1  24.6   30.8   0.0   66

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
        <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  8    1.18 0.51  0.022                         1.00 0.52              1.27                                    6.2
  8- 20    1.53 0.59  0.026                         0.74 0.53                     1.08  1.18                 25.4  10.9  0.10
 20- 38    1.29 0.41  0.019                         0.82 0.57                     1.18  1.28                 29.3  10.8  0.11
 38- 66    0.64 0.34  0.013                         1.87 0.93                     1.59  1.63  0.005          14.3  8.0   0.05
 66- 86    0.51 0.28  0.011                         1.26 0.63                                                      7.9
 86-117    0.52 0.27  0.023                         2.14 0.94                                                      6.8
117-153    0.17 0.19  0.029                         2.67 1.07                                                      6.1
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        AVERAGES,   DEPTH  25-100:  PCT CLAY    9  PCT  .1-75MM    84

-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-091-2*
SAMPLED AS    : STRONGHOLD           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 835, SAMPLE 86P5008-5014

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

-------- -----------------------------------------------------------------------------------------------------------------------------
           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC    CA    MG    NA     K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                             PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B       6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                          8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0-  8     35.3 1.46  -.-   0.90                        34.7          718  4.94  0.50  0.13  0.36  0.005  0.20  1.500   0.72  0.20  2.16  7.78
  8- 20     35.5 1.12  -.-   0.40                        14.7          895  5.00  0.41  0.16  0.14  0.002  0.23  0.316   0.47  0.21  2.24  7.44
  20- 38    34.2 1.07  0.01  0.16                        42.2          617  4.81  0.44  0.29  0.06  0.003  0.18  1.468   0.76  0.16  1.57  7.58
  38- 66    40.2 1.62  0.06  0.20                        43.2          670  4.05  0.42  0.28  0.05  0.002  0.24  0.679   0.93  0.20  0.71  7.71
  66- 86    37.2 2.62  0.17  0.27                        40.0          890  4.28  0.63  0.49  0.07  0.002  0.28  1.263   1.51  0.28  1.46  7.72
  86-117    33.3 4.20  0.33  0.27                        34.0          923  3.69  0.75  0.98  0.08  0.006  0.22  1.389   1.73  0.21  1.16  7.63
  117-153   30.3 4.44  0.80  0.53                        28.8          960  2.27  0.61  2.30  0.09  0.009  0.21  2.021   0.44  0.17  1.96  7.70
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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  3,  4,  5,  6,  7,


-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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NARRATIVE PEDON DESCRIPTION

Pedon: Stronghold
NSSL Pedon Number: 86P0835
Soil Survey Number S85-AZ-003-091
Location: Cochise County, Arizona
1110' N and 1250' E of SW corner of Sec. 25, T.19S., R.23E. Approximate.
Latitude: 31-44-54.79-N
Longitude: 109-57-11.70-W
Physiography: terracettes in
Slope: 5% convex southwest facing
Elevation: 1537 m MSL
Precipitation: cm - Udic Moisture Regime.
Water Table Depth: 0
Permeability: Moderately rapid
Drainage: Somewhat excessively drained
Land Use:
Stoniness:
Erosion or Deposition: Slight
Runoff:
Parent Material:
Classification: Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcid
Diagnostic Horizons:
Described By: Dr. William Emmerich
Sample Date: 12/85

A1 -- 0 to 8 cm; very dark grayish brown (10YR 3/2) moist extremely gravelly sandy loam; grayish brown (10YR 5/2) dry; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very coarse roots; few medium interstitial pores; strongly effervescent; moderately alkaline (pH=8.2); clear wavy boundary.

A2 -- 8 to 20 cm; dark brown (10YR 3/3) moist very gravelly sandy loam; brown to dark brown (10YR 4/3) dry; weak very fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very coarse roots; few coarse interstitial pores; strongly effervescent; moderately alkaline (pH=8.2); clear wavy boundary.

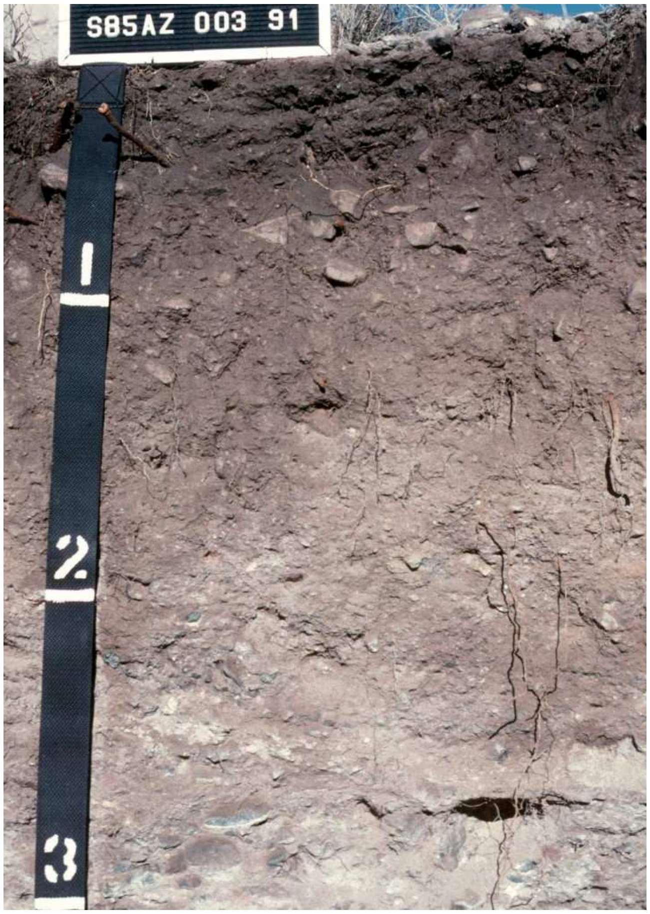
Bw1 -- 20 to 38 cm; brown to dark brown (10YR 4/3) moist very gravelly sandy loam; brown (10YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few coarse roots; few coarse interstitial pores; violently effervescent; clear wavy boundary.

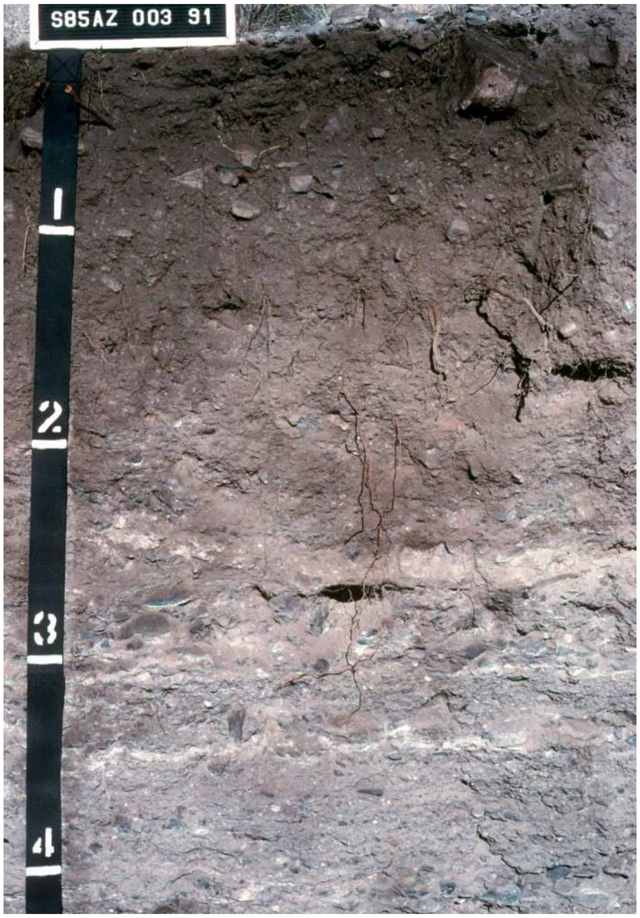
Bk1 -- 38 to 66 cm; brown (7.5YR 5/4) moist very gravelly sandy loam; light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few medium roots; few medium interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary.

2Bk2 -- 66 to 86 cm; reddish brown (5YR 4/3) moist very gravelly loamy sand; reddish brown (5YR 5/3) dry; hard, friable, nonsticky, nonplastic; few medium roots; few medium interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary.

2Bk3 -- 86 to 117 cm; brown to dark brown (7.5YR 4/2) moist very gravelly loamy sand; brown (7.5YR 5/2) dry; hard, friable, nonsticky, nonplastic; few fine roots; many coarse interstitial pores; strongly effervescent; strongly alkaline (pH=8.4); clear wavy boundary.

2Bk4 --117 to 152 cm; brown (7.5YR 5/4) moist extremely gravelly loamy sand; pinkish gray (7.5YR 6/2) dry; very hard, friable, nonsticky, nonplastic; few fine roots; many coarse interstitial pores; strongly effervescent; strongly alkaline (pH=8.4).


S85AZ 003 91
1
2
3


S85AZ 003 91
1
2
3
4

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-092 (Pedon 92)                              (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : STRONGHOLD           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                            U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 836, SAMPLES 86P5015-5017                                                    SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-10.05-N                                                   Longitude: 109-57-15.14-W
Elevation: 1505 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                           NATIONAL SOIL SURVEY LABORATORY
                                                                                                LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC    - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1     2     5    20     .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2    -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A1          12.5  15.5  72.0                                8.2   24.2  22.2  9.2   8.2   6.9  14.2  25.0  0.0   46
         5-  15   A2          21.2  22.1  56.7                                6.5   16.5  12.5  9.5  11.5  12.1  16.8  10.0  0.0   40
86P5015S 15- 48   BW          17.9  26.1  56.0                                6.2   9.2   12.2 14.2  14.2  17.3  9.1   1.0   0.0   28
86P5016S 48- 91   2BK1        13.5  23.9  62.7                                7.5   11.5  15.5 15.5  12.5  17.0  23.0  11.4  0.0   52
86P5017S 91- 134  2BK2        10.1  20.9  68.9                                6.0   12.0  23.0 15.0  13.0  16.1  16.8  3.1   0.0   36
         134-177  2CR         9.5   20.9  69.6                                4.9   15.9  20.9 14.9  12.9  10.3  31.1  34.9  0.0   76
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->            PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    0.98  0.30  0.019                                                 1.25
  5-  15   1.65  0.40  0.023
  15- 48   0.71  0.28  0.020                                                       1.49  1.53  0.009             17.5
  48- 91   0.39  0.21  0.016                                                       1.53  1.57  0.009             15.6
  91- 134  0.17  0.20  0.022                                                       1.69  1.80  0.021             11.9
  134-177  0.16  0.21  0.024
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-092
SAMPLED AS    : STRONGHOLD           ; COARSE-LOAMY, MIXED, SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 836, SAMPLE 86P5015-5017

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES              CATS   OAC  + AL   8A3A                                                         PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                     8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <------------------MEQ/L--------->< UEQ/L> <---—MEQ/L----->
  0-  5     25.9  0.90  -.-   0.58                          35.8         780  4.17  0.31  0.08  0.24  0.003  0.12  1.926  0.44  0.12  1.95  8.21
  5-  15    23.8  1.09  -.-   0.30                          47.0         850  5.39  0.34  0.09  0.18  0.003  0.18  0.947  0.29  0.20  2.26  7.69
  15- 48    34.6  1.32  -.-   0.15                          10.8         637  4.95  0.33  0.18  0.06  0.003  0.10  0.947  0.67  0.15  1.32  7.86
  48- 91    32.2  2.17  1.10  0.21                          33.4         638  3.64  0.45  0.38  0.06  0.009  0.16  0.789  0.93  0.19  1.15  7.78
  91- 134   28.8  3.11  0.41  0.11                          40.1         662  2.67  0.51  1.24  0.06  0.006  0.13  2.242  1.04  0.13  1.28  7.74
  134-177   27.9  2.91  1.36  0.23                          35.1         753  2.09  0.52  2.42  0.06  0.037  0.11  2.921  0.61  0.65  1.34  7.84
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NARRATIVE PEDON DESCRIPTION

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Pedon: Stronghold                                                    NSSL Pedon Number: 86P0836
Soil Survey Number S85-AZ-003-092
Location: Cochise County, Arizona
   1575' E and 2100' N of SW corner of Sec. 36, T.19S., R.23E.  Approximate.
Latitude: 31-44-10.05-N                                              Longitude: 109-57-15.14-W
Physiography: terracettes in
Slope:   8%  convex northwest facing                                 Elevation: 1505 m MSL
Precipitation:     cm - Udic Moisture Regime.
Water Table Depth:    0                                              Permeability: Moderately rapid
Drainage: Somewhat excessively drained                               Land Use:
Stoniness:                 Erosion or Deposition: Slight             Runoff:
Parent Material:
Classification: Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcid
Diagnostic Horizons:
Described By: Carl Glocker, Dr. William Emmerich, Dr. Grossman          Sample Date: 11/85
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A1 -- 0 to 5 cm; very dark grayish brown (10YR 3/2) moist very gravelly sandy loam; dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few medium vesicular pores; strongly effervescent; moderately alkaline (pH=8.2); abrupt wavy boundary.

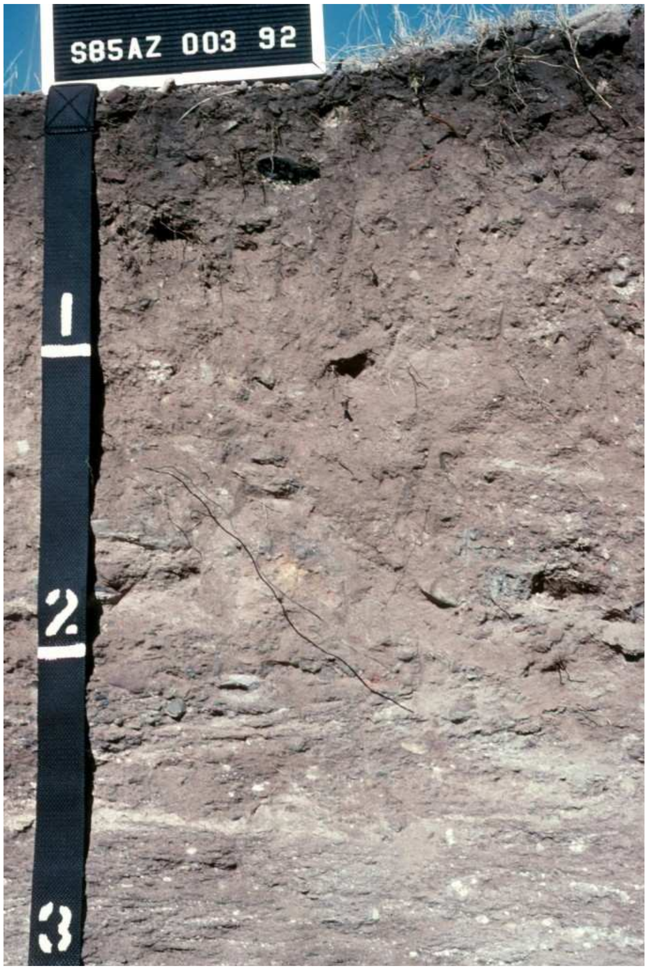
A2 -- 5 to 15 cm; dark brown (10YR 3/3) moist gravelly sandy loam; brown to dark brown (10YR 4/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few fine tubular pores and; strongly effervescent; moderately alkaline (pH=8.2); 15 percent pebbles; clear wavy boundary.

Bw -- 15 to 48 cm; brown to dark brown (10YR 4/3) moist gravelly sandy loam; brown (10YR 5/3) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few medium roots; few fine tubular pores and; violently effervescent; strongly alkaline (pH=8.4); 12 percent pebbles; abrupt wavy boundary. Few fine irregular lime accumulations as masses and in root channels and pores.

2Bk1 -- 48 to 91 cm; (10YR 5/3) (7.5Y R/5) moist gravelly sandy loam; light brown (7.5YR 6/4) dry; very hard, friable, nonsticky, nonplastic; few fine roots; few medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 32 percent pebbles; abrupt wavy boundary. Common medium lime accumulations as irregular masses and as widely spaced horizontal strata 1/4 to 2 thick.

2Bk2 -- 91 to 135 cm; brown to dark brown (7.5YR 4/4) moist very gravelly sandy loam; brown (7.5YR 5/4) dry; very hard, friable, nonsticky, nonplastic; few fine roots; few medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 18 percent pebbles; abrupt wavy boundary. Common medium lime accumulations as irregular masses and as widely spaced horizontal strata 1/4 to 2 thick.

2Ck --135 to 178 cm; brown to dark brown (7.5YR 4/4) moist extremely gravelly loamy sand; brown (7.5YR 5/4) dry; very hard, friable, nonsticky, nonplastic; few fine roots; few medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 70 percent pebbles. Apears to be loose conglomerate. Comon medium lime accumulations as irregular masses and as widely spaced horizontal strata 1/4 to 2 thick.


S85AZ 003 92
1
2
3


S85AZ 003 92
1
2
3
4
5

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                         ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-093 (Pedon 93)                           (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : TOMBSTONE             ; LOAMY-SKELETAL, MIXED SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                       ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                    U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 837, SAMPLES 86P5018-5023                                            SOIL CONSERVATION SERVICE
Location:
Latitude: 31-44-17.12-N                                                      Longitude: 109-58-54.33-W
Elevation: 1471 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                   NATIONAL SOIL SURVEY LABORATORY
                                                                                        LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT   .002  .02   .05   .10   .25    .5     1    2     5    20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

86P5018S   0-  5   A           9.4  15.1  75.5         1.5   5.5   9.6  12.6  32.4  17.9   7.3   5.3   8    18    17      79  43
86P5019S   5- 15   BW         20.0  21.5  58.5         7.9  12.4   9.1   9.6  20.1  11.3   7.8   9.7   8    27    22      78  57
86P5020S  15- 30   BW2        22.1  24.2  53.7         9.3  16.9   7.3  10.1  18.8  10.5   6.5   7.8  14    18    21      73  53
86P5021S  30- 76  2BK1        12.7  26.2  61.1         5.1  19.1   7.1   9.9  15.8   9.8   9.9  15.7  14    25    15      78  54
86P5022S  76-134  2BK2         8.8  17.9  73.3         1.7  12.5   5.4   9.9  27.7  13.8  10.3  11.6  13    22    11      80  46
86P5023S 134-180  2BK3         7.8  15.6  76.6         0.6  11.0   4.6  14.1  30.5  10.5   9.7  11.8  12    26    27      87  65

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            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S        EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3    15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
  (CM)      6A1C  6B3A   6S3  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A3A  4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2a  4C1
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->              PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

  0-  5     0.99                                      0.99  0.68                                                     6.4
  5- 15     1.49                                      0.58  0.55                                                    10.9
 15- 30     1.12                                      0.47  0.46                                                    10.2
 30- 76     0.35                                      0.67  0.46                                                     5.9
 76-134     0.11                                      0.94  0.57                                                     5.0
134-180     0.13                                      1.35  0.74                                                     5.8
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        AVERAGES,   DEPTH  25-100:  PCT CLAY    8  PCT  .1-75MM    78
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-093
SAMPLED AS    : TOMBSTONE            ; LOAMY-SKELETAL, MIXED SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 837, SAMPLE 86P5018-5023

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID-      (- -CEC-  -) EXCH   SAR     BASE    CO3 AS RES.   CASO4 AS  (- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY        SUM   NH4-   NA         SATURATION  CACO3 OHMS    GYPSUM    SAT  CACL2  H2O
 DEPTH      5B5A  5B5A  5B5A  5B5A BASES              CATS   OAC               SUM NH4OAC <2MM   /CM  <2MM <20MM PASTE  .01M
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A        5A3A  5A8B  5B5B    5E   5C3   5C1  6E1G  8E1   6F1A   6F4  8C1B  8C1F  8C1F
            <- - - - - - - - - -MEQ / 100 G - - - - - - - - - ->   PCT        <- -PCT- >   PCT        <- -PCT ->         1:2  1:1

  0-  5            0.8    TR   0.5                           9.3    TR    TR                24                     7.7   7.5   8.0
  5- 15            0.9    TR   0.3                          11.5    TR    TR                39                     7.6   7.5   8.0
 15- 30            1.2    TR   0.2                          10.3    TR                      47                           7.5   8.1
 30- 76            1.5   0.1   0.1                           8.5     1                      50                           7.6   8.1
 76-134            3.1   0.4   0.2                           8.3     3     2                35  1600               7.7   7.8   8.2
134-180            3.9   1.2   0.3                          10.5     8     6                26                     7.7   7.8   8.3

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           (- - - - - - - -WATER EXTRACTED FROM SATURATED PASTE- - - - - - - - - -)
                                                                       TOTAL ELEC.
             CA    MG    NA     K    CO3  HCO3   CL    SO4   NO3  H2O  SALTS COND.
 DEPTH                                                                  EST.  8A3A
  (CM)      6N1B  6O1B  6P1B  6Q1B  6I1B  6J1B  6K1C  6L1C  6M1C   8A   8D5  MMHOS
           < - - - - - - - - - -MEQ / LITER - - - - - - - - - - > <- -PCT ->  /CM

  0-  5      5.6   0.5   0.2   0.4    --   5.4   0.2   0.7    --  31.0    TR  0.62
  5- 15      4.1   0.3   0.2   0.2    --   3.9   0.3   0.5    --  47.4    TR  0.47
 15- 30                                                                       0.24
 30- 76                                                                       0.19
 76-134     10.2   4.9   4.4   0.1    --   1.5   0.4  17.5    --  27.9    TR  1.69
134-180      5.1   2.6  10.9   0.2    --   2.4   8.2   7.8    --  32.4    TR  1.91

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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  3,  4,
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-093-2*                                (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : TOMBSTONE            ; LOAMY-SKELETAL, MIXED SUPERACTIVE, THERMIC USTIC HAPLOCALCID
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                                U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 837, SAMPLES 86P5018-5023                                                        SOIL CONSERVATION SERVICE
     - GENERAL METHODS  1B1A, 2A1, 2B                                                               NATIONAL SOIL SURVEY LABORATORY
                                                                                                    LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
         0-  5    A           12.1  16.9  71.0                            10.8  22.8   17.8  9.8   10.8  8.8   24.0   15.4   0.0   49
         5- 15    BW          23.5  21.0  55.6                            9.0   16.0   12.0  7.0   12.0  9.5   28.2   20.8   0.0   59
         15- 30   BW2         25.5  23.0  52.0                            7.5   12.5   11.5  8.5   11.5  11.0  21.5   20.0   0.0   53
         30- 76   2BK1        21.5  24.3  54.3                            7.3   14.3   11.3  9.3   12.3  12.9  19.2   14.6   0.0   47
         76-134   2BK2        12.1  19.6  68.3                            10.1  20.1   16.1  10.1  12.1  12.9  29.2   10.6   0.0   53
         134-180  2BK3        8.8   16.9  74.3                            9.1   28.1   14.1  11.1  12.1  10.9  21.1   26.5   1.0   59

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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P     S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4    4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0-  5    1.27  0.38  0.38                           0.99  0.68              0.89                                         6.4
  5- 15    1.62  0.38  0.02                           0.58  0.55                                                           10.9
  15- 30   1.10  0.43  0.02                           0.47  0.46                                                           10.2
  30- 76   0.36  0.31  0.01                           0.67  0.46                                                           5.9
  76-134   0.19  0.26  0.01                           0.94  0.57                                                           5.0
  134-180  0.19  0.25  0.01                           1.35  0.74                                                           5.8
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        AVERAGES,   DEPTH  25-100:  PCT CLAY    8  PCT  .1-75MM    78

-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-093-2*
SAMPLED AS    : TOMBSTONE            ; LOAMY-SKELETAL, MIXED SUPERACTIVE, THERMIC USTIC HAPLOCALCID
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 837, SAMPLE 86P5018-5023

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES   EC   CA    MG    NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES                CATS   OAC  + AL   8A3A                                                           PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                         8C1B
            <- - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L---------><UEQ/L> <---–MEQ/L----->
  0-  5     27.8  0.86   0.01  0.62                         27.0         800  7.09  0.65  0.17  0.28  0.006  0.26  3.979   0.55  0.26  1.90  7.60
  5-  15    38.6  1.77   0.06  0.48                         33.4         570  5.03  0.39  1.53  0.14  0.013  0.19  1.816   0.41  0.33  1.92  7.62
  15- 30    34.8  1.82   0.04  0.17                         26.4         702  6.86  0.48  0.20  0.06  0.005  0.23  0.284   0.56  0.29  1.64  7.90
  30- 76    30.0  1.62   0.01  0.15                         23.0         830  5.90  0.62  0.32  0.06  0.012  0.18  0.284   1.56  0.20  0.83  7.54
  76- 134   30.3  3.94   0.41  0.08                         22.0        2780  10.9  3.17  3.84  0.09  0.008  0.25  1.721   1.96  0.47  1.05  7.79
  134-180   28.0  4.52   1.38  0.36                         22.6        3820  6.24  1.30  11.7  0.12  0.008  0.18  0.979   1.92  10.5  1.24  7.54
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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  3,  4,


-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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NARRATIVE PEDON DESCRIPTION

Pedon: Tombstone NSSL Pedon Number: 86P0837
Soil Survey Number S85-AZ-003-093
Location: Cochise County, Arizona
1400' N and 1200' W of SE corner of Sec. 34, T.19S., R.23E. Approximate.
Latitude: 31-44-17.12-N Longitude: 109-58-54.33-W
Physiography: Upland slope in
Slope: 9% convex south facing Elevation: 1471 m MSL
Precipitation: cm - Udic Moisture Regime.
Water Table Depth: 0 Permeability: Moderately rapid
Drainage: Somewhat excessively drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: Loamy-skeletal, mixed superactive, thermic Ustic Haplocalcid
Diagnostic Horizons:
Described By: Carl Glocker Sample Date: 11/85
Rock fragments are mostly limestone, andesite and pan fragments.

A -- 0 to 5 cm; brown to dark brown (10YR 4/3) moist very gravelly sandy loam; light brownish gray (10YR 6/2) dry; weak coarse platy structure; soft, very friable, nonsticky, nonplastic; few fine roots; few medium vesicular pores and; strongly effervescent; moderately alkaline (pH=8.2); 35 percent pebbles; abrupt wavy boundary. Much of the gravel composed of pan fragments.

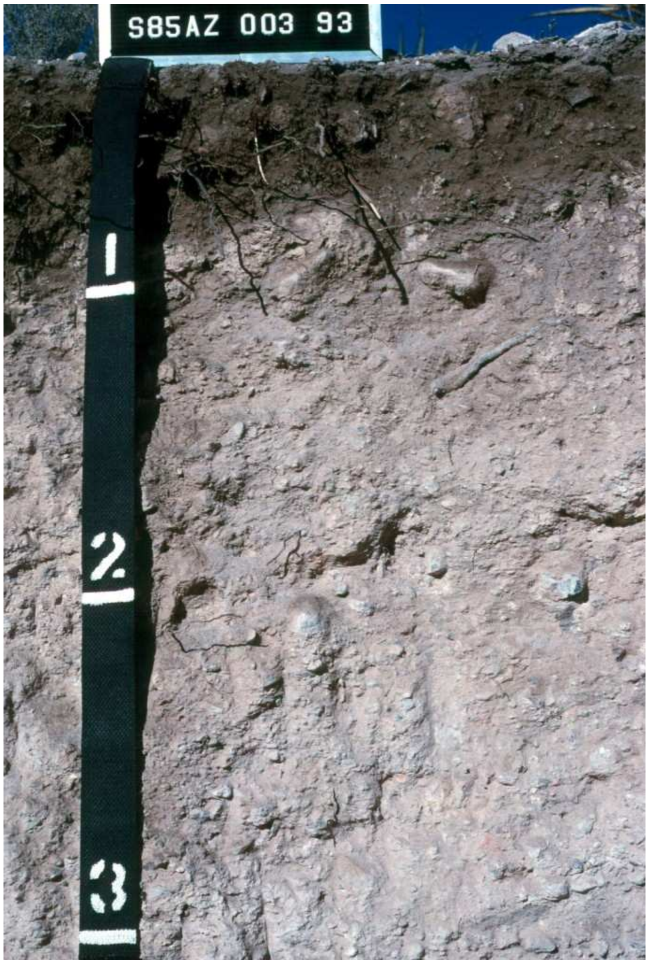
Bw1 -- 5 to 15 cm; brown (10YR 5/3) moist very gravelly sandy loam; brown (10YR 5/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); clear wavy boundary. Much of the gravel composed of pan fragments.

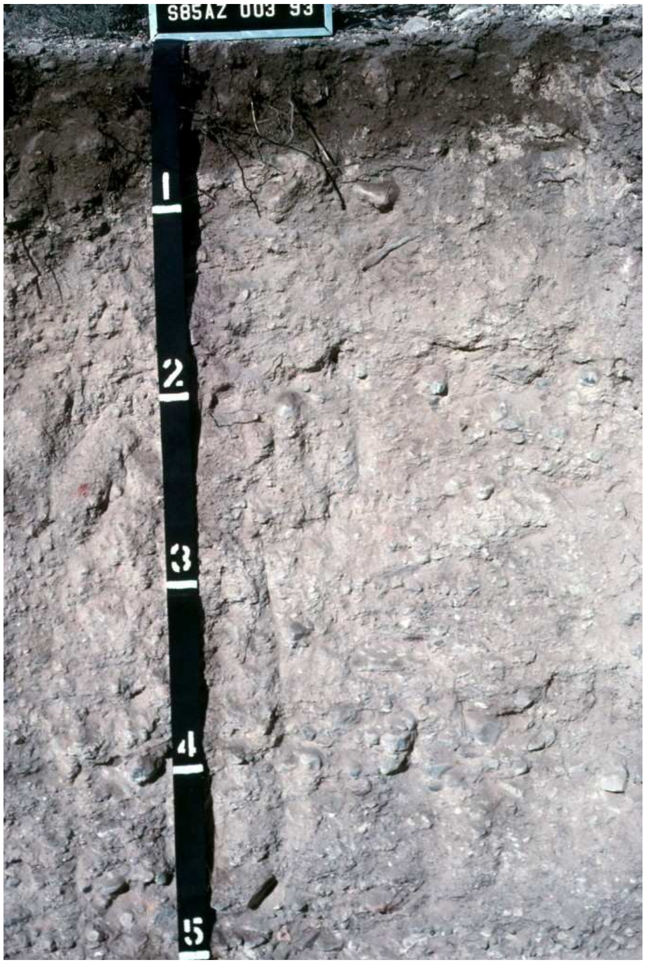
Bw2 -- 15 to 30 cm; pale brown (10YR 6/3) moist very gravelly sandy loam; pale brown (10YR 6/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many medium roots; few fine interstitial pores; violently effervescent; strongly alkaline (pH=8.4); abrupt wavy boundary. Much of the gravel composed of pan fragments.

2BK1 -- 30 to 76 cm; very pale brown (10YR 7/3) moist very gravelly sandy loam; light gray (10YR 7/2) dry; soft, very friable, nonsticky, nonplastic; few medium roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 55 percent pebbles; clear wavy boundary. Many large irregular lime masses and nodules, many pan fragments.

2Bk2 -- 76 to 135 cm; very pale brown (10YR 7/3) moist very gravelly sandy loam; light gray (10YR 7/2) dry; soft, very friable, nonsticky, nonplastic; few fine roots; few fine interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 30 percent pebbles; abrupt wavy boundary. Many large irregular lime masses and nodules, many pan fragments.

2Bk3 --135 to 178 cm; pale brown (10YR 6/3) moist very gravelly loamy sand; light brownish gray (10YR 6/2) dry; soft, very friable, nonsticky, nonplastic; few fine roots; many medium interstitial pores and; violently effervescent; strongly alkaline (pH=8.4); 60 percent pebbles. Many large irregular lime masses and nodules, many pan fragments.


S85AZ 003 93
1
2
3


S85AZ 003 93
1
2
3
4
5

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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-094 (Pedon 94)                          (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : SCHIEFFLIN           ; MIXED, THERMIC, LITHIC TORRIPSAMMENT
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 838, SAMPLES 86P5024-5027                                                       SOIL CONSERVATION SERVICE
Location:
Latitude: 31-43-49.51-N                                                     Longitude: 110-06-13.16-W
Elevation: 1311 m
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT     LT   .002  .02   .05   .10   .25    .5     1    2     5     20     .1- PCT OF
 NO.      (CM)                .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1    -2   -5   -20   -75    75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL

86P5024S   0-  5   A1          8.0   8.1  83.9              3.8   4.3   9.8  17.0  17.4  21.5  18.2   8     1    --      76   9
86P5025S   5- 15   BW1        11.5   7.5  81.0              3.8   3.7  10.1  22.1  20.0  16.8  12.0  20    10     8      82  38
86P5026S  15- 38   BW2        14.0   8.1  77.9              4.4   3.7   9.5  16.3  15.9  18.6  17.6  22     1    --      76  23
86P5027S  38- 43  2CR          8.2   5.4  86.4              3.3   2.2   7.7  17.3  19.1  22.5  19.8  44     7    --      90  51

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            ORGN TOTAL  EXTR TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                 FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR  DRY   SOIL MOIST  BAR   BAR   BAR  SOIL
  (CM)      6A1C  6B3A   6S3  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A3A  4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2a  4C1
            PCT   <2MM   PPM <- PERCENT  OF  <2MM -->             PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM

  0-  5     0.33                                     1.36  0.54                                                          4.3
  5- 15     0.36                                     1.32  0.39                                                          4.5
 15- 38     0.40                                     1.16  0.37                                                          5.2
 38- 43     0.30                                     1.46  0.56                                                          4.6
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***

S85AZ-003-094
SAMPLED AS    : SCHIEFFLIN           ; MIXED, THERMIC, LITHIC TORRIPSAMMENT
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 838, SAMPLE 86P5024-5027

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -)  AL   -BASE SAT- CO3 AS RES.        COND.(- - - -PH - - -)
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  SAT   SUM   NH4  CACO3 OHMS        MMHOS      CACL2  H2O
 DEPTH      5B5A  5B5A  5B5A  5B5A BASES              CATS   OAC  + AL               OAC  <2MM   /CM         /CM        .01M
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A8B  5A3B   5G1   5C3   5C1  6E1G  8E1          8I        8C1F  8C1F
            <- - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->  <- - - - -PCT - - - ->                           1:2  1:1

  0-  5     11.1   1.5    TR   0.3  12.9   0.2        13.1  10.9                98   100     1              0.10         6.9   7.6
  5- 15     15.1   1.9   0.1   0.3  17.4   0.7        18.1  15.2                96   100     1              0.09         7.2   7.8
 15- 38     19.1   2.1   0.1   0.2  21.5   0.3        21.8  16.3                99   100     1              0.14         7.5   8.1
 38- 43     13.7   1.6   0.1   0.1  15.5   0.7        16.2  12.0                96   100     1              0.15         7.5   8.2

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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  1,  2,  3,  4,
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                              ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***
S85AZ-003-094-2*                                (COCHISE COUNTY, ARIZONA)

SAMPLED AS    : SCHIEFFLIN           ; MIXED, THERMIC, LITHIC TORRIPSAMMENT
REVISED TO    :                      ;

NSSL - PROJECT 86P 143, WALNUT GULCH                                                               U. S. DEPARTMENT OF AGRICULTURE
     - PEDON   86P 838, SAMPLES 86P5024-5027                                                       SOIL CONSERVATION SERVICE
     - GENERAL METHODS  1B1A, 2A1, 2B                                                              NATIONAL SOIL SURVEY LABORATORY
                                                                                                   LINCOLN, NEBRASKA 68508-3866

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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                             (- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - -  - -SAND- -  - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)
                              CLAY  SILT  SAND  FINE   CO3  FINE COARSE  VF     F     M     C    VC   - - - - WEIGHT - - - -   WT
SAMPLE     DEPTH   HORIZON     LT   .002  .05    LT    LT   .002  .02   .05   .10   .25    .5     1    2    5     20     .1- PCT OF
  NO.      (CM)               .002  -.05   -2  .0002  .002  -.02  -.05  -.10  -.25  -.50   -1     -2   -5   -20   -75     75  WHOLE
                              <- - - - - - - - - - - - PCT OF <2MM  (3A1) - - - - - - - - - - - - - ->  <- PCT OF <75MM(3B1)->  SOIL
86P5024S   0- 5    A1         8.8  12.3  78.9                             9.6   14.6   20.6  19.6  14.6  5.9   0.66   0.0    0.0   7
86P5025S   5- 15   BW1        10.1 14.3  75.6                             5.7   13.7   19.7  20.7  15.7  8.2   0.44   8.1    1.0   17
86P5026S   15-38   BW2        12.8 12.3  74.9                             7.8   11.8   15.8  18.8  20.8  17.0  0.71   0.0    1.0   18
86P5027S   38-43   2CR        6.8  9.6   83.6                             4.9   7.9    18.9  22.9  28.9  36.3  4.10   0.0    0.0   40
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            ORGN TOTAL  TOTAL TOTAL (- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG )(- BULK DENSITY -) COLE (- - -WATER CONTENT - -)  WRD
             C     N      P    S       EXTRACTABLE          15   - LIMITS -  FIELD  1/3  OVEN  WHOLE FIELD  1/10   1/3   15  WHOLE
 DEPTH                                FE    AL    MN    CEC   BAR   LL    PI   MOIST  BAR   DRY   SOIL MOIST   BAR   BAR   BAR  SOIL
 (CM)       6A1A  6B1    6S1  6R3A  6C2B  6G7A  6D2A   8D1   8D1  4F1    4F   4A5    4A1D  4A1H  4D1   4B4   4B1C  4B1C  4B2A  4C1
          <-PCT   PCT    PCT    PERCENT  OF  <2MM -->              PCT <0.4MM  <- - G/CC - - -> CM/CM  <- - -PCT OF <2MM - -> CM/CM
  0- 5     0.53 0.30  0.06                          1.36  0.54                                                            4.3
  5- 15    0.56 0.29  0.05                          1.32  0.39                                                            4.5
  15-38    0.62 0.34  0.06                          1.16  0.37                                                            5.2
  38-43    0.47 0.29  0.06                          1.46  0.56                                                            4.6
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-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC

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                                 ***   P R I M A R Y   C H A R A C T E R I Z A T I O N   D A T A   ***


S85AZ-003-094-2*
SAMPLED AS    : SCHIEFFLIN           ; MIXED, THERMIC, LITHIC TORRIPSAMMENT
NATIONAL SOIL SURVEY LABORATORY      ; PEDON 86P 838, SAMPLE 86P5024-5027

            -1--  -2--  -3--  -4--  -5--  -6--  -7--  -8--  -9--  -10-  -11-  -12-  -13-  -14-  -15-  -16-  -17-  -18-  -19-  -20-

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           (- NH4OAC EXTRACTABLE BASES -) ACID- EXTR (- - - -CEC - - -) -----------WATER EXTRACT FROM SATURATED PASTE 8A1 -----------    PH
             CA    MG    NA     K   SUM    ITY   AL   SUM   NH4-  BASES  EC   CA    MG   NA    K    NO3-N  NH3  PO4-P   SO4   Cl   HCO3  SAT.
 DEPTH      5B4A  5B4A  5B4A  5B4A BASES               CATS   OAC  + AL   8A3A                                                        PASTE
  (CM)      6N2E  6O2D  6P2B  6Q2B        6H5A  6G9A  5A3A  5A2A  5A3B   uMHOS6N1B  6O1B 6P1B 6Q1B                                     8C1B
            <- - - - - - - - - - - - - -MEQ / 100 G - - - - - - - - - - - ->   /CM  <-------------------MEQ/L---------><UEQ/L> <----MEQ/L----->
  0- 5       8.1  1.86  -.-   0.51                        22.7         780  3.44  0.71  0.26  0.19  0.096  0.16  2.084  0.24  0.30  0.68  7.77
  5- 15     10.1  2.23  0.01  0.25                        30.7         681  2.45  0.55  0.26  0.07  0.095  0.24  1.310  0.33  0.21  0.75  7.53
  15-38     12.6  2.58  0.07  0.11                        25.2         608  2.36  0.57  0.34  0.06  0.091  0.34  1.105  0.43  0.28  1.12  7.10
  38-43     12.6  3.08  0.06  0.07                        24.4         605  2.49  0.48  0.35  0.04  0.021  0.08  1.153  0.77  0.09  0.14  7.43
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        MMHOS/CM OF 1:2 WATER EXTRACT (8I) & EXCH NA AS EXTRACTABLE NA FOR LAYERS  1,  2,  3,  4,


-2* Split samples analyzed by NRCS and -2* by UDSA-ARS SWRC
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NARRATIVE PEDON DESCRIPTION

Pedon: Schiefflin NSSL Pedon Number: 86P0838
Soil Survey Number S85-AZ-003-094
Location: Cochise County, Arizona
1320' W and 125' S of the NE corner of Sec. 4, T.20S., R.22E. Approximate.
Latitude: 31-43-49.51-N Longitude: 110-06-13.16-W
Slope: 7% convex northeast facing Elevation: 1311 m MSL
Precipitation: cm - Udic Moisture Regime.
Water Table Depth: 0 Permeability: Moderately rapid
Drainage: Somewhat excessively drained Land Use:
Stoniness: Erosion or Deposition: Slight Runoff:
Parent Material:
Classification: mixed, thermic, lithic Torripsamment
Diagnostic Horizons:
Described By: Carl Glocker Sample Date: 11/85
Upto 35% of the soil volume is occupied by gravel, cobble, stone, rocks and boulders. Percent varies considerably over short distances. All are grandiorite. About 15% surface is covered with rocks and boulders to 6' in diameter.

A -- 0 to 5 cm; very dark grayish brown (10YR 3/2) moist coarse sandy loam; brown to dark brown (10YR 4/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine roots; very few interstitial pores; mildly alkaline (pH=7.4); clear wavy boundary. 10% fine angular pebbles.

Bw1 -- 5 to 15 cm; dark brown (10YR 3/3) moist coarse sandy loam; brown to dark brown (10YR 4/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many fine roots; few medium interstitial pores; mildly alkaline (pH=7.6); clear wavy boundary. 10% fine angular pebbles.

Bw2 -- 15 to 38 cm; dark brown (7.5YR 3/4) moist coarse sandy loam; brown to dark brown (7.5YR 4/4) dry; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many fine roots; few medium interstitial pores; moderately alkaline (pH=7.8); abrupt wavy boundary. 10% angular pebbles.

2Cr -- 38 to 46 cm; moist gravelly coarse sand; slightly hard; few fine roots and; 25 percent pebbles. Saprolite (grus).

2R -- 46 to 46 cm; moist. Grandiorite


S85AZ 003 94
1

*** Primary Characterization Data ***

Pedon ID: 99AZ003001 (Cochise, Arizona) Print Date: Dec 4 2008 9:49AM

Sampled as : Luckyhills

Revised to :

United States Department of Agriculture
Natural Resources Conservation Service
National Soil Survey Center
Soil Survey Laboratory
Lincoln, Nebraska 68508-3866

SSL - Project CP99AZ090 WALNUT GULCH SCAN
- Site ID 99AZ003001 Lat: 31° 44' .60" north Long: 110° 3' .10" west
- Pedon No. 99P0323
- General Methods 1B1A, 2A1, 2B

Layer	Horizon	Orig Hzn	Depth (cm)	Field Label 1	Field Label 2	Field Label 3	Field Texture	Lab Texture
99P01639	A	A	0-7				LS	COSL
99P01640	Bk1	Bk1	7-32				L	L
99P01641	Bk2	Bk2	32-52				L	L
99P01642	Bkm3	Bk3m	52-81				L	L
99P01643	Bk4	Bk4	81-95				SL	COSL
99P01644	2C	2C	95-110				LS	COSL

PSDA & Rock Fragments				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-
				(- - - - - Total - - - - - -)			(- - Clay - - -)		(- - - - Silt - - - - -)		(- - - - - - - - - - - - Sand - - - - - - - - - - - -)					(Rock Fragments (mm))				
				Clay	Silt	Sand	Fine	CO$_3$	Fine	Coarse	VF	F	M	C	VC	(- - - - - - - - Weight - - - - - - - -)				>2 mm
				<	.002	.05	<	<	.002	.02	.05	.10	.25	.5	1	2	5	20	.1-	wt %
	Depth			.002	-.05	-2	.0002	.002	-.02	-.05	-.10	-.25	-.50	-1	-2	-5	-20	-75	75	whole
Layer	(cm)	Horz	Prep	(- % of <2mm Mineral Soil -)												(- - - - - - % of <75mm - - - - - -)				soil
				3A1	3A1	3A1		3A1	3A1	3A1	3A1	3A1	3A1	3A1	3A1	3B1	3B1	3B1		
99P01639	0-7	A	S	11.7	18.3	70.0			9.8	8.5	7.6	17.5	16.5	13.8	14.6	13	24	20	84	57
99P01640	7-32	Bk1	S	22.4	29.4	48.2		7.8	20.9	8.5	5.4	9.9	8.6	9.9	14.4	14	32	18	79	64
99P01641	32-52	Bk2	S	21.0	38.6	40.4		7.8	29.4	9.2	5.9	9.1	6.3	6.8	12.3	13	20	22	71	55
99P01642	52-81	Bkm3	S	15.6	39.3	45.1		5.0	29.2	10.1	7.9	11.4	7.7	8.2	9.9	16	21	26	77	63
99P01643	81-95	Bk4	S	12.4	24.4	63.2		1.8	16.2	8.2	6.6	13.9	12.2	11.5	19.0	21	30	15	85	66
99P01644	95-110	2C	S	8.0	17.0	75.0			10.1	6.9	8.5	23.9	15.8	8.3	18.5	24	46	6	92	76

*** Primary Characterization Data ***

Pedon ID: 99AZ003001 (Cochise, Arizona) Print Date: Dec 4 2008 9:49AM

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USDA-NRCS-NSSC-National Soil Survey Laboratory ; Pedon No. 99P0323

Bulk Density & Moisture				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-
				(Bulk Density)		Cole	(- - - - - - - - - - - Water Content - - - - - - - - - - -)						WRD	Aggst		
				33	Oven	Whole	6	10	33	1500	1500 kPa	Ratio	Whole	Stabl	(- - Ratio/Clay - -)	
	Depth			kPa	Dry	Soil	kPa	kPa	kPa	kPa	Moist	AD/OD	Soil	2-0.5mm	CEC7	1500 kPa
Layer	(cm)	Horz	Prep	(- - - g cm^{-3} - - -)			(- - - - - - - - - - - - % of < 2mm - - - - - - - - - - - -)						cm^{3} cm^{-3}	%		
										4B2a		4B5			8D1	8D1
99P01639	0-7	A	S							6.6		1.014			0.99	0.56
99P01640	7-32	Bk1	S							11.2		1.019			0.55	0.50
99P01641	32-52	Bk2	S							10.9		1.020			0.50	0.52
99P01642	52-81	Bkm3	S							9.5		1.019			0.69	0.61
99P01643	81-95	Bk4	S							8.6		1.018			0.80	0.69
99P01644	95-110	2C	S							6.9		1.016			1.21	0.86

Carbon & Extractions				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-
				(- - - - - Total - - - - -)			Org	C/N	(- - - Dith-Cit Ext - - -)			(- - - - - - Ammonium Oxalate Extraction - - - - - -)						(- - - Na Pyro-Phosphate - - -)			
	Depth			C	N	S	C	Ratio	Fe	Al	Mn	Al+½Fe	ODOE	Fe	Al	Si	Mn	C	Fe	Al	Mn
Layer	(cm)	Horz	Prep	(- - - - - - % of <2 mm - - - - - -)					(- % of < 2mm - - - - - - - - - - - - - - - - - -)								mg kg^{-1}	(- - - - - - % of < 2mm - - - - -)			
				6A2e	6B4a				6C2h	6G7g	6D2g										
99P01639	0-7	A	S	2.14	0.108				0.6	tr	tr										
99P01640	7-32	Bk1	S	4.42	0.101				0.3	tr	tr										
99P01641	32-52	Bk2	S	6.00	0.091				0.3	tr	tr										
99P01642	52-81	Bkm3	S	4.87	0.048				0.3	tr	tr										
99P01643	81-95	Bk4	S	2.00	0.019				0.3	tr	tr										
99P01644	95-110	2C	S	0.97	0.012				0.4	tr	tr										

*** Primary Characterization Data ***

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USDA-NRCS-NSSC-National Soil Survey Laboratory ; Pedon No. 99P0323

CEC & Bases				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-
				(- - - - - - NH_4OAC Extractable Bases - - - - -)								CEC8	CEC7	ECEC		(- - - - Base - - - -)	
								Sum	Acid-	Extr	KCl	Sum	NH_4	Bases	Al	(- Saturation -)	
	Depth			Ca	Mg	Na	K	Bases	ity	Al	Mn	Cats	OAC	+Al	Sat	Sum	NH_4OAC
Layer	(cm)	Horz	Prep	(- - - - - - - - - - - - - - - - - cmol(+) kg^{-1} - - - - - - - - - - - - - - - - - - -)							mg kg^{-1}	(- - - - cmol(+) kg^{-1} - - -)			(- - - - - - - - % - - - - - - - -)		
				6N2i	6O2h	6P2f	6Q2f						5A8b			5C3	5C1
99P01639	0-7	A	S	43.3*	1.4	0.3	0.6						11.6			100	100
99P01640	7-32	Bk1	S	49.8*	1.5	0.3	0.2						12.4			100	100
99P01641	32-52	Bk2	S	43.6*	1.6	0.3	0.2						10.5			100	100
99P01642	52-81	Bkm3	S	46.1*	3.1	0.4	0.1						10.7			100	100
99P01643	81-95	Bk4	S	41.8*	4.2	0.6	0.1						9.9			100	100
99P01644	95-110	2C	S	36.1*	4.2	0.6	0.1						9.7			100	100

*Extractable Ca may contain Ca from calcium carbonate or gypsum., CEC7 base saturation set to 100.

Salt				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-
				(- Water Extracted From Saturated Paste -)																	Pred		
																			Total	Elec	Elec	Exch	
	Depth			Ca	Mg	Na	K	CO_3	HCO_3	F	Cl	PO_4	Br	OAC	SO_4	NO_2	NO_3	H_2O	Salts	Cond	Cond	Na	SAR
Layer	(cm)	Horz	Prep	(- - - - - mmol(+) L^{-1} - - - - -)				(- mmol(-) L^{-1} -)										(- - - - % - - - -)		(- - dS m^{-1} - -)		%	
				6N1d	6O1d	6P1d	6Q1d	6I1b	6J1b	6U1c	6K1e				6L1e	6W1c	6M1e	8A	8D5	8A3a	8I	5D2	5E
99P01639	0-7	A	S																		0.12	3	
99P01640	7-32	Bk1	S																		0.11	2	
99P01641	32-52	Bk2	S																		0.12	3	
99P01642	52-81	Bkm3	S																		0.20	4	
99P01643	81-95	Bk4	S	9.3	4.8	2.8	0.1	--	1.5	0.3	1.9				13.0	0.1	0.4	38.8	tr	1.49	0.44	5	1
99P01644	95-110	2C	S	10.9	8.1	3.9	0.2	--	2.0	0.1	4.2				18.0	--	0.1	29.6	tr	1.82	0.38	5	1

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USDA-NRCS-NSSC-National Soil Survey Laboratory ; Pedon No. 99P0323

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pH & Carbonates

				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-
				(- - - - - - - - - - - - - - - - - -	- pH -	- - - - -	- - - - -	- - - - -	- - - - -)	(- - Carbonate - -)		(- - Gypsum - - -)		
					$CaCl_2$					As $CaCO_3$		As $CaSO_4$*$2H_2O$		Resist
	Depth				0.01M	H_2O	Sat			<2mm	<20mm	<2mm	<20mm	ohms
Layer	(cm)	Horz	Prep	KCl	1:2	1:1	Paste	Sulf	NaF	(- - - - - - - - - - - -	- - - % - - -	- - - - - - -	- - - - - - - -)	cm^{-1}
					4C1a2a	4C1a2a	8C1b			6E1h				
99P01639	0-7	A	S		7.6	8.2				9				
99P01640	7-32	Bk1	S		7.9	8.6				35				
99P01641	32-52	Bk2	S		7.7	8.4				44				
99P01642	52-81	Bkm3	S		7.8	8.2				33				
99P01643	81-95	Bk4	S		8.1	8.7	7.6			15				
99P01644	95-110	2C	S		7.9	8.2	7.6			7				

*** Supplementary Characterization Data ***

Pedon ID: 99AZ003001 (Cochise, Arizona) Print Date: Dec 4 2008 9:49AM

Sampled as : Luckyhills

Revised to :

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Natural Resources Conservation Service
National Soil Survey Center
Soil Survey Laboratory
Lincoln, Nebraska 68508-3866

SSL - Project CP99AZ090 WALNUT GULCH SCAN
- Site ID 99AZ003001 Lat: 31° 44' .60" north Long: 110° 3' .10" west
- Pedon No. 99P0323
- General Methods 1B1A, 2A1, 2B

Tier 1				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-	-21-	-22-	-23-	-24-	-25-
				(- Engineering PSDA -)													(- - - - - Cumulative Curve Fractions - - - - -) (<75mm)								(Atter-)		(Gradation)	
				Percentage Passing Sieve													USDA Less Than Diameters (mm) at								berg		Uni-	Cur-
	Depth			3	2	3/2	1	3/4	3/8	4	10	40	200	20	5	2	1.	.5	.25	.10	.05	60	50	10	LL	PI	fmty	vtur
Layer	(cm)	Horz	Prep	(-------------------Inches-------------------)						(---------Number---------)				(------Microns----)			(---------Millimeter----------)					(-----Percentile---)			(----%----)		CU	CC
99P01639	0-7	A	S	100	94	90	84	80	68	56	43	29	15	9	7	5	37	31	24	16	13	5.93	3.168	0.024			>100	1.5
99P01640	7-32	Bk1	S	100	95	91	86	82	66	50	36	26	20	16	11	8	31	27	24	21	19	7.27	4.700	0.004			>100	27.7
99P01641	32-52	Bk2	S	100	94	89	83	78	68	58	45	36	28	23	15	9	39	36	34	29	27	5.40	2.778	0.002			>100	1.1
99P01642	52-81	Bkm3	S	100	92	87	79	74	64	53	37	30	22	17	10	6	33	30	27	23	20	7.49	4.004	0.005			>100	5.9
99P01643	81-95	Bk4	S	100	96	93	88	85	70	55	34	23	14	10	6	4	28	24	19	15	13	5.93	3.835	0.022			>100	13.1
99P01644	95-110	2C	S	100	98	97	95	94	71	48	24	17	7	4	3	2	20	18	14	8	6	6.77	4.994	0.137			49.5	6.6

Tier 2				-26-	-27-	-28-	-29-	-30-	-31-	-32-	-33-	-34-	-35-	-36-	-37-	-38-	-39-	-40-	-41-	-42-	-43-	-44-	-45-	-46-	-47-	-48-	-49-	-50-
				(- Weight Fractions -)														(- - - - - - - - - - - Weight Per Unit Volume (g cm^{-3})- - - - - - - -)									(- - Void - -)	
				Whole Soil (mm)								<75 mm Fraction						Whole Soil				<2 mm Fraction					Ratios	
				>2	250	250	75	75	20	5		75	75	20	5			Soil Sur		Engineering		Soil Survey			Engineering		At 33 kPa	
	Depth				-UP	-75	-2	-20	-5	-2	<2	-2	-20	-5	-2	<2		33	Oven	Moist	Satur	33	1500	Oven	Moist	Satur	Whole	<2
Layer	(cm)	Horz	Prep	(------------------- % of Whole Soil ------------------)								(--------- % of <75 mm ---------)						kPa	-dry		-ated	kPa	kPa	-dry		-ated	Soil	mm
													3B1	3B1	3B1													
99P01639	0-7	A	S	57	--	--	57	20	24	13	43	57	20	24	13	43		1.95										
99P01640	7-32	Bk1	S	64	--	--	64	18	32	14	36	64	18	32	14	36		2.04										
99P01641	32-52	Bk2	S	55	--	--	55	22	20	13	45	55	22	20	13	45		1.93										
99P01642	52-81	Bkm3	S	63	--	--	63	26	21	16	37	63	26	21	16	37		2.03										
99P01643	81-95	Bk4	S	66	--	--	66	15	30	21	34	66	15	30	21	34		2.08										
99P01644	95-110	2C	S	76	--	--	76	6	46	24	24	76	6	46	24	24		2.23										

Tier 3				-51-	-52-	-53-	-54-	-55-	-56-	-57-	-58-	-59-	-60-	-61-	-62-	-63-	-64-	-65-	-66-	-67-	-68-	-69-	-70-	-71-	-72-	-73-	-74-	-75-
				(- - - - - - - - - - - - - - - - - Volume Fractions - - - - - - - - - - - - - - - - -)													C	(- - - - - - - Ratios To Clay - - - - - -)					(- - Linear Extensiblity - -)				(- - WRD - -)	
				Whole Soil (mm) At 33 kPa													/N	<2 mm Fraction					Whole Soil		<2 mm		Whole	<2
				>2	250	250	75	75	20	5		2-	.05-	LT	Pores		Rat	Fine	CEC		1500	LEP	33 kPa		to %		Soil	mm
	Depth				-UP	-75	-2	-20	-5	-2	<2	.05	.002	.002	D	F	-io	Clay	Sum	NH_4-	kPa	33	1500	Oven	1500	Oven		
Layer	(cm)	Horz	Prep	(---------------------------- % of Whole Soil --------------------------)															Cats	OAC	H_2O	kPa	kPa	-dry	kPa	-dry	(---in^3/in^3---)	
																					8D1							
99P01639	0-7	A	S	41	--	--	41	15	17	9	59	22	6	4	26						0.56							
99P01640	7-32	Bk1	S	49	--	--	49	14	25	11	51	13	8	6	23						0.50							
99P01641	32-52	Bk2	S	40	--	--	40	16	15	9	60	13	13	7	27						0.52							
99P01642	52-81	Bkm3	S	48	--	--	48	20	16	12	52	13	11	4	23						0.61							
99P01643	81-95	Bk4	S	52	--	--	52	12	24	17	48	16	6	3	22						0.69							
99P01644	95-110	2C	S	64	--	--	64	5	39	20	36	15	3	2	16						0.86							

Tier 4				-76-	-77-	-78-	-79-	-80-	-81-	-82-	-83-	-84-	-85-	-86-	-87-	-88-	-89-	-90-	-91-	-92-	-93-	-94-	-95-	-96-	-97-	-98-
				(- - - - - - - - - - - - - - - - - - - Weight Fractions - Clay Free - - - - - - - - - - - - - - - - - -)															Text	PSDA (mm)			pH	Elect.		Part-
				(--------------- Whole Soil ---------------)						(------------------- <2 mm Fraction -------------------)									-ure	Sand	Silt	Clay	Ca	Res-	Con-	-icle
				>2	75	20	2-	.05-	<	(------------- Sands -------------)					(--- Silts ---)		Cl		by	2-	.05-	<	Cl_2	ist.	duct	Den-
	Depth				-20	-2	.05	.002	.002	VC	C	M	F	VF	C	F	ay		PSDA	.05	.002	.002	.01M	ohms	dS m^{-1}	sity
Layer	(cm)	Horz	Prep	(- % of >2 mm Sand and Silt -)						(------------------% of Sand and Silt -------------)									<2 mm	(---- % of 2 mm ----)			(-------- <2 mm --------)			g cm^{-3}
																			3A1	3A1	3A1	3A1	4C1a2a		8A3a	
99P01639	0-7	A	S	60	60	39	32	8	5	17	16	19	20	9	10	11	13		cosl	70.0	18.3	11.7	7.6			
99P01640	7-32	Bk1	S	70	70	50	19	12	9	19	13	11	13	7	11	27	29		l	48.2	29.4	22.4	7.9			
99P01641	32-52	Bk2	S	61	61	36	20	19	10	16	9	8	12	7	12	37	27		l	40.4	38.6	21.0	7.7			
99P01642	52-81	Bkm3	S	67	67	39	18	15	6	12	10	9	14	9	12	35	18		l	45.1	39.3	15.6	7.8			
99P01643	81-95	Bk4	S	69	69	53	22	9	4	22	13	14	16	8	9	18	14		cosl	63.2	24.4	12.4	8.1		1.49	
99P01644	95-110	2C	S	77	77	71	18	4	2	20	9	17	26	9	8	11	9		cosl	75.0	17.0	8.0	7.9		1.82	

*** Taxonomy Characterization Data ***

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Sampled as : Luckyhills

Revised to :

United States Department of Agriculture
Natural Resources Conservation Service
National Soil Survey Center
Soil Survey Laboratory
Lincoln, Nebraska 68508-3866

SSL - Project CP99AZ090 WALNUT GULCH SCAN

- Site ID 99AZ003001 Lat: 31° 44' .60" north Long: 110° 3' .10" west
- Pedon No. 99P0323
- General Methods 1B1A, 2A1, 2B

Taxonomy Tier 1				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
					Fine	CaCO$_3$	1500		.1-75	Bulk	Cole	Vol	Resist
				Clay	Clay	Clay	kPa	Clay	mm	Den	Whole	% of	Min
	Depth			<.002	<.0002	<.002	/Clay	Est	Frac	33 kPa	Soil	Whole	%
Layer	(cm)	Horz	Prep	(---------% of <2 mm-------)				(-------- % --------)		g cm^{-3}	cm cm^{-1}		
				3A1		3A1	8D1						
99P01639	0-7	A	S	11.7			0.56		84			41	
99P01640	7-32	Bk1	S	22.4		7.8	0.50		79			49	
99P01641	32-52	Bk2	S	21.0		7.8	0.52		71			40	
99P01642	52-81	Bkm3	S	15.6		5.0	0.61		77			48	
99P01643	81-95	Bk4	S	12.4		1.8	0.69		85			52	
99P01644	95-110	2C	S	8.0			0.86		92			64	

Taxonomy Tier 2				-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	-14-	-15-	-15-
				pH	pH	Org	Tot	Al+½ Fe		CO_3 as	(--- Base Sat ---)		NZ	ECEC	CEC7	ECEC	Al		
	Depth			H_2O	NaF	C	C	Oxal	ODOE	$CaCO_3$	NH_4	Bases	P Ret	cmol(+)	/Clay	/Clay	Sat	E C	ESP
Layer	(cm)	Horz	Prep			(-- % ---)								kg $^{-1}$			%	dS m^{-1}	%
				4C1a2a			6A2e			6E1h	5C1	5C3			8D1			8A3a	5D2
99P01639	0-7	A	S	8.2			2.14			9	100[*]	100			0.99				3
99P01640	7-32	Bk1	S	8.6			4.42			35	100[*]	100			0.55				2
99P01641	32-52	Bk2	S	8.4			6.00			44	100[*]	100			0.50				3
99P01642	52-81	Bkm3	S	8.2			4.87			33	100[*]	100			0.69				4
99P01643	81-95	Bk4	S	8.7			2.00			15	100[*]	100			0.80			1.49	5
99P01644	95-110	2C	S	8.2			0.97			7	100[*]	100			1.21			1.82	5

[*] Extractable Ca may contain Ca from calcium carbonate or gypsum.

PEDON DESCRIPTION

Print Date: 12/04/2008

Description Date: 03/19/1999

Describer:

Site ID: 99AZ003001

Site Note:

Pedon ID: 99AZ003001

Pedon Note: Physiography: Fan Terraces; Lightly effervescent throughout; 2 bugs y each horizon; no clods samples; ARS measured bulk density by comput cavity at 0-6", 18-24", and 38-44"

Lab Source ID: SSL

Lab Pedon #: 99P0323

Soil Name as Described/Sampled: LUCKYHILLS

Soil Name as Correlated:

Classification:

Pedon Type:

Pedon Purpose:

Taxon Kind:

Associated Soils:

Physiographic Division:

Physiographic Province:

Physiographic Section:

State Physiographic Area:

Local Physiographic Area:

Geomorphic Setting: None Assigned

Upslope Shape:

Cross Slope Shape:

Country:

State: Arizona

County: Cochise

MLRA:

Soil Survey Area: AZ671 -- Cochise County, Arizona, Douglas-Tombstone Part

Map Unit:

Quad Name:

Location Description: Tombstone, AZ; ARS Walnut Gulch Watershed, Lucky Hills site

Legal Description:

Latitude: 31 degrees 44 minutes 0.60 seconds north

Longitude: 110 degrees 3 minutes 0.10 seconds west

Datum:

UTM Zone:

UTM Easting:

UTM Northing:

Primary Earth Cover:

Secondary Earth Cover:

Existing Vegetation:

Parent Material:

Bedrock Kind:

Bedrock Depth:

Bedrock Hardness:

Bedrock Fracture Interval:

Particle Size Control Section:

Surface Fragments:

Description origin: Converted from PDP 3.x

Description database: NSSL

Diagnostic Features: ? to ? cm.

Cont. Site ID: 99AZ003001

Pedon ID: 99AZ003001

Slope (%)	Elevation (meters)	Aspect (deg)	MAAT (C)	MSAT (C)	MWAT (C)	MAP (mm)	Frost-Free Days	Drainage Class	Slope Length (meters)	Upslope Length (meters)
8.0										

A--0 to 7 centimeters; dark yellowish brown (10YR 4/4) loamy sand, dark yellowish brown (10YR 4/6), dry; many fine roots and common medium roots; 5 percent unspecified fragments; clear wavy boundary. Lab sample # 99P01639. field: 1

Bk1--7 to 32 centimeters; yellowish red (5YR 4/6) loam, reddish brown (5YR 5/4), dry; many fine roots and common medium roots; 10 percent unspecified fragments; clear wavy boundary. Lab sample # 99P01640. %Ca Conc. - 40; field: 2

Bk2--32 to 52 centimeters; loam, pink (5YR 7/4), dry; common fine roots; 10 percent unspecified fragments; gradual wavy boundary. Lab sample # 99P01641. %Ca Conc. - 40; field: 3

Bk3--52 to 81 centimeters; loam, pink (5YR 7/4), dry; few fine roots; 10 percent unspecified fragments; clear smooth boundary. Lab sample # 99P01642. %Ca Conc.-80; field: 4

Bk4--81 to 95 centimeters; gravelly sandy loam, red (2.5YR 5/8), dry; few fine roots; 15 percent unspecified fragments; gradual wavy boundary. Lab sample # 99P01643. %Ca Conc. - 60; field: 5

2C--95 to 110 centimeters; gravelly loamy sand, yellowish red (5YR 5/6), dry; few fine roots; 20 percent unspecified fragments. Lab sample # 99P01644. field: 6

Table 1. Walnut Gulch Soil Physical Properties

Soil Type	Layer #	Depth	Gravel %	Sand %	Silt %	Clay %	Very Coarse Sand 1mm No. 18	Coarse Sand 0.5mm No. 35	Medium Sand 0.25mm No. 60	Fine Sand 0.106mm No. 140	Very Fine Sand 0.053mm No. 270	Moisture Release Curves % Moisture Content (g/g)	
												1/3 bar	15 bar
Sutherland	1	0-2"	41.1	60.3	27.6	12.1	6.2	8.9	10.4	21.9	13.7	16.3	9.1
Sutherland	2	2-8"	58.4	55.1	29.5	15.4	8.2	8.5	8.0	16.3	11.2	21.1	12.5
Sutherland	3	8-10"	91.6	not enough sample			not enough sample					22.5	11.3
Sutherland	4	10-60"	65.0	52.5	38.9	8.7	11.9	12.2	8.1	10.8	9.0	19.8	7.1
Sutherland	1	0-1"	26.7	58.9	31.9	9.3	9.0	9.4	9.0	14.5	10.8	15.2	8.1
Sutherland	2	1-8"	41.1	51.3	33.3	15.5	10.5	8.4	7.6	13.5	10.7	20.2	11.2
Sutherland	3	8-18"	38.1	49.8	34.9	15.3	9.9	8.2	6.9	10.7	8.6	21.4	11.3
Sutherland	4	18-42"	70.1	65.1	31.4	3.5	not enough sample					22.4	7.6
Sutherland	5	42-60"	57.7	65.0	31.4	3.7	14.8	12.3	9.1	11.4	10.1	19.1	7.2
Mule	1	0-2"	42.5	55.1	31.6	13.2	9.1	9.8	9.1	13.8	9.0	19.7	7.0
Mule	2	2-10"	59.0	49.6	36.1	14.3	8.1	7.5	7.0	11.3	7.5	19.9	11.8
Mule	3	10-22"	64.8	46.7	41.0	12.3	11.2	14.2	9.5	6.6	1.6	21.6	10.2
Mule	4	22-60"	67.6	50.6	39.9	9.4	10.5	11.3	8.3	9.9	7.7	18.6	7.8
Bodecker	1	0-3"	31.9	84.6	11.9	3.6	12.2	14.1	14.7	25.2	14.5	6.6	3.1
Bodecker	2	3-12"	42.4	97.1	0.6	2.3	18.5	30.6	30.0	14.7	1.6	3.4	2.3
Bodecker	3	12-29"	69.9	95.8	1.8	2.3	21.6	26.4	23.4	15.4	2.9	4.4	2.4
Bodecker	4	29-48"	25.6	95.8	1.8	2.3	18.0	39.9	30.1	8.8	0.7	2.4	1.6
Bodecker	5	48-60"	81.1	93.1	3.6	3.2	29.9	35.8	21.3	5.7	0.6	5.1	3.0
Blacktail	1	0-1"	52.4	70.3	15.0	14.7	16.7	16.2	15.3	14.3	6.1	14.8	10.3
Blacktail	2	1-8"	21.3	43.9	19.7	36.4	7.2	10.5	8.6	9.3	4.7	26.9	19.5
Blacktail	3	8-16"	30.1	42.9	13.9	43.2	9.0	9.7	6.6	6.6	3.7	32.5	21.3
Blacktail	4	16-34"	40.8	71.7	12.7	15.6	17.9	21.3	11.9	8.9	3.8	17.8	12.8
Blacktail	5	34-43"	45.3	72.9	14.9	12.9	20.8	17.1	11.6	10.0	4.8	16.9	11.0
Blacktail	6	43-60"	66.8	76.2	18.1	5.8	17.6	20.8	13.4	11.3	5.1	16.4	10.2
Lucky Hills	1	0-3"	21.1	80.8	14.0	5.2	7.4	16.3	16.8	23.7	10.4	8.1	3.8
Lucky Hills	2	3-26"	23.2	68.9	24.1	7.1	9.4	14.8	10.4	16.2	10.5	12.4	6.6
Lucky Hills	3	26-34"	45.4	67.6	22.4	10.0	12.8	14.4	10.3	13.7	8.6	10.9	6.0
Lucky Hills	4	34-60"	7.7	46.9	39.9	13.3	2.6	3.1	3.6	13.3	13.7	15.9	8.2
Epitaph	1	0-1"	8.1	30.2	37.0	32.8	2.1	2.0	2.7	4.4	3.6	41.5	23.4
Epitaph	2	1-6"	19.1	30.6	34.3	35.1	1.8	2.2	3.2	6.1	4.2	41.2	21.0
Epitaph	3	6-27"	5.6	24.1	28.8	47.2	1.1	1.7	1.9	3.8	3.4	48.8	24.8
Epitaph	4	27-28"	50.5	76.0	21.2	2.8	27.2	18.9	11.1	9.1	4.8	26.2	13.1
Epitaph	5	28-60"	78.3	93.8	4.0	2.2	23.0	27.3	24.7	11.6	2.3	6.3	3.3

Table 2. Walnut Gulch Soil Chemical Properties

Soil Type	Layer #	Depth	TN % NCS	TC % NCS	TOC % NCS	TP µg/g	pH s.u. sat. paste	EC mmhos/ om sat. paste	K mg/L sat. paste	Na mg/L sat. paste	Ca mg/L sat. paste	Mg mg/L sat. paste	CEC meq/100g
Sutherland	1	0-2"	0.09	4.68	0.81	264	8.38	0.694	12.9	25.5	124	6.89	29.0
Sutherland	2	2-8"	0.12	6.36	3.31	326	8.14	1.24	12.0	26.3	262	15.3	33.9
Sutherland	3	8-10"	0.08	8.04	0.52	184	not enough soil		not enough soil to make a paste				18.0
Sutherland	4	10-60"	0.03	7.38	0.27	135	8.18	0.634	8.69	29.9	83.5	26.2	28.6
Sutherland	1	0-1"	0.11	4.07	1.71	365	8.42	0.749	38.8	27.8	119	9.41	32.0
Sutherland	2	1-8"	0.11	4.46	2.08	331	8.35	0.623	22.1	25.8	105	6.33	38.0
Sutherland	3	8-18"	0.09	5.44	0.79	351	8.31	0.517	14.9	24.5	90.0	4.34	33.1
Sutherland	4	18-42"	0.02	7.81	1.18	145	8.55	0.486	25.6	15.4	99.3	6.34	30.0
Sutherland	5	42-60"	0.01	6.35	1.40	143	7.69	2.43	10.8	169	380	63.7	28.5
Mule	1	0-2"	0.15	6.95	1.11	367	8.22	0.836	25.1	21.9	131	12.1	33.7
Mule	2	2-10"	0.20	7.99	1.81	451	8.28	0.413	12.3	10.8	103	9.09	38.6
Mule	3	10-22"	0.07	8.32	1.55	258	8.25	0.482	10.3	19.9	69.7	8.39	27.0
Mule	4	22-60"	0.04	7.96	0.42	306	8.17	1.24	15.5	31.3	197	52.0	24.3
Bodecker	1	0-3"	0.03	1.28	0.35	469	8.46	0.626	24.2	23.2	92.9	5.68	23.7
Bodecker	2	3-12"	0.01	0.87	0.28	421	8.27	0.271	14.0	10.7	43.9	2.05	18.5
Bodecker	3	12-29"	0.01	0.84	0.08	426	8.28	0.558	13.3	22.1	93.2	5.17	19.8
Bodecker	4	29-48"	0.01	0.86	0.04	552	8.17	0.271	7.92	11.0	41.8	2.35	16.9
Bodecker	5	48-60"	0.01	0.78	0.06	281	8.27	0.477	15.9	22.8	72.8	4.04	24.2
Blacktail	1	0-1"	0.12	1.62	0.93	384	8.05	1.28	44.5	17.5	175	46.9	38.6
Blacktail	2	1-8"	0.12	1.59	1.30	319	8.15	0.447	11.2	20.6	57.5	16.8	52.8
Blacktail	3	8-16"	0.10	1.20	1.07	339	8.18	0.475	16.5	35.1	49.2	12.7	51.1
Blacktail	4	16-34"	0.02	0.24	0.12	546	8.62	0.516	9.96	44.9	53.6	14.4	40.8
Blacktail	5	34-43"	0.01	1.41	0.15	584	8.48	0.470	12.5	50.6	43.6	10.6	36.0
Blacktail	6	43-60"	0.01	2.61	0.61	484	8.41	0.516	6.87	76.2	34.3	6.94	35.5
Lucky Hills	1	0-3"	0.03	0.84	0.18	343	8.52	0.610	24.0	17.5	103	7.00	23.0
Lucky Hills	2	3-26"	0.04	1.22	0.28	433	8.35	0.555	14.7	30.0	93.1	5.46	23.2
Lucky Hills	3	26-34"	0.03	1.29	0.21	488	8.33	0.402	3.90	22.6	61.3	5.72	24.6
Lucky Hills	4	34-60"	0.02	1.45	0.09	530	8.01	0.868	6.20	67.1	114	20.4	26.4
Epitaph	1	0-1"	0.10	1.60	1.39	393	8.54	0.730	21.2	24.3	114	10.9	56.4
Epitaph	2	1-6"	0.07	1.08	1.06	410	8.53	0.518	11.3	39.6	62.5	6.42	48.8
Epitaph	3	6-27"	0.06	0.99	0.88	295	8.83	0.615	8.17	90.3	38.1	4.11	53.0
Epitaph	4	27-28"	0.03	4.47	0.25	827	8.37	2.22	12.6	370	189	27.5	34.9
Epitaph	5	28-60"	0.01	0.81	0.08	306	8.10	2.15	22.9	33.9	511	26.9	20.6